AUTOMOBILE DEALER AND REPAIRER

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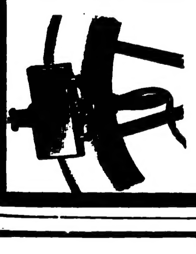

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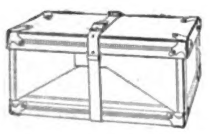

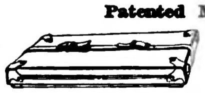

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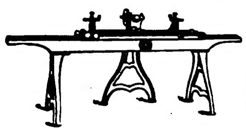

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Asbury Park, N. J.

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Automobile Dealer and Repairer

A PRACTICAL JOURNAL EXCLUSIVELY FOR THESE INTERESTS

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GARAGE CONSTRUCTION.

New Buildings That Are Fireproof, Convenient, Pleasing to the Eye and Models for Prospective Builders.

Now that the automobile business is firmly established on a permanent foundation much attention is being given the construction of garages, and many are being put up all over the country that are models of convenience and pleasing to the eye.

In garage construction there are several points that are of the utmost importance. Sometimes the car has to go into its house with the hood or luggage rail up, and a spare tire on its roof. For this a height of nine feet should be allowed. As to length, cars occasionally run up to as much as eighteen feet, and allowance must be made for this.

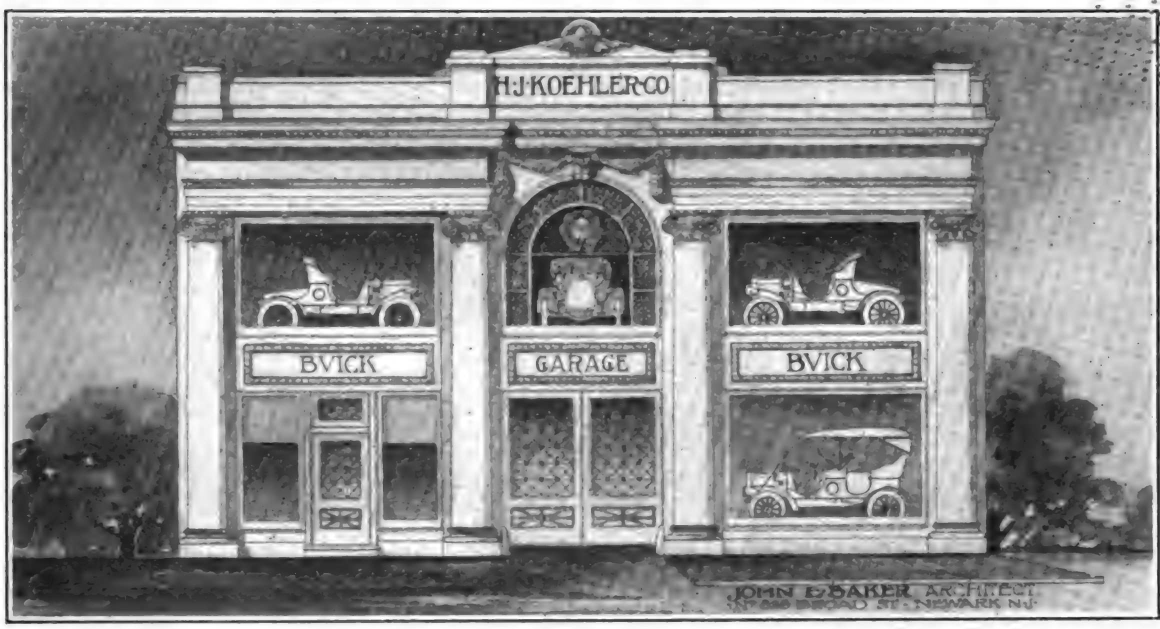
The walls should either be faced with bricks or of such other material as is non-absorbent, and can be easily washed down. All angles to recesses should be rounded, and there should be few projecting features.

The gas resulting from the evaporation of gasoline is heavier than the air, and getting rid of it presents a problem in ventilation. For the floor in the larger number of the garages and motor houses there is cement laid to a smooth finish, but cement seems to be injured by the action of oil, and granolithic seems to be better as it has more stone chips on the surface.

But there are many other matters of decided importance which should be carefully considered, such as pits, washing places and heating.

The illustration shows an up-to-date garage about to be erected in Main street, at the junction of the Lackawanna Railroad, in East Orange, N. J., for the firm of H. J. Koehler Company, of Newark, N. J., agent for the Buick cars. The building is 50x100 feet, and will be constructed of reinforced concrete and fireproof construction. The front part of the garage will contain general offices, a smoking room, ladies' retiring rooms, etc., furnished with mission furniture. The second floor will be divided into a machine shop containing 3,920 square feet of floor space, and storage room. The building will be heated by steam and provided with elevators for carrying cars to and from the upper floor.

John E. Baker, the architect, of Newark, N. J., who designed the structure and all its details, has treated the subject most thoroughly, and has turned out what is undoubtedly one of the most artistic and complete garages in the country.



Automobiles in Surgery Cases.

Still another new use has been found applicable to the automobile. According to "The Journal of American Surgery" it has proved valuable in overcoming one of the most trying necessities of emergency surgery, the provision of suitable light. Country farmhouses and many city homes have no other light than oil lamps or candles, which are totally unfit for light for surgical purposes. It seems that a surgeon was called out into the country to attend to a case of appendicitis, and at a farmhouse where there was poor light. The kitchen was used as the operating room, and the "family ironing board" with either end on a small stand served as an operating table.

While the nurse made the operating room preparations, preparations for providing light were made in the following manner:

The automobile was driven as close as practical to the

kitchen window, the large searchlight lamp detached from the machine and passed into the kitchen. Rubber tubing ordinarily used for drainage was spliced by a glass drainage tube and used to connect the gas tank on the side of the auto with the lamp in the kitchen surgery. The gas was then turned on, lighted and the illumination found to be ideal. In fact, the light was just as good as in any well-appointed operating room.

The patient was prepared on the table. The usual incision was made and a large gangrenous appendix with a perforation, and an enterolith in about its middle portion, removed. The abdomen was closed without drainage, and the patient made an uneventful recovery.

Next to the danger of time loss, we cannot but be impressed with the great danger in the mechanical disturbance of the parts in moving a patient in such a condition over rough country roads, which of necessity would tend not only to mechanically scatter the infection caused by the perforation, but by starting a peristalsis of the stomach and intestines, thereby also scatter the infection to such a degree as to cause general peritonitis.

Next to the early diagnosis of the family physician and his prompt action, the auto, with its gas tank and lamp, was a strong factor in the means of saving a man's life.

Knowledge by Experience.

"Experience teaches one a lot about the 'little things' in motoring," says one of the Ford managers. "Take the spark plug, for instance. It takes experience to teach a driver that it is unnecessary to tighten the thumb screw on top of the plug with pliers; in fact, this should never be done, as you are liable to turn the core, and thereby open or close the spark gap more than is desirable. Tighten the nut with the fingers just sufficiently so it will not come off and get lost. Then, again, if you are caught on the road with weak dry cells, there's the trick of drilling a small hole through the sealing compound on top of each battery and filling them up with water—only a few spoonfuls will be required for each. You should be careful not to allow the water to run down the side so as to saturate the cardboard, as the cardboard is an insulation between the negative poles of the batteries. Your batteries then will carry you about ten miles without further trouble.

"One sometimes has trouble with the platinum points which pit through excessive battery current or long usage. As they do not wear away evenly this causes them to stick together occasionally or to deliver a drizzling spark. The remedy is to file the surface off carefully, using a piece of fine emery cloth wrapped around a flat file, knife blade, or some other suitable article. Be sure to file the surface flat so as to give a good contact. If burned away entirely, replace with a new one. One system of a leak in the condenser is a very 'fat' bluish spark at the vibrator points."

It is considered good practice to throw out the clutch when striking a bump or other obstruction in the road. By doing so the mechanism of the car is relieved of excessive strain and is less liable to breakage.

Automobile Speed Law.

A New York law prohibits the operation of a motor in thickly settled highways at a greater speed than a mile in six minutes, and provides $100 penalty, or imprisonment, and authorizes cities to make similar ordinances, provided they post notices on the highway as to the speed regulated. The City of New York passed an ordinance fixing the fine at from one to ten dollars, and failed to post the notice. A prosecution under the State law could not be prevented by claiming that the city ordinance superseded it, where such notice limiting speed was not posted on the highway.—People vs. Keeper, 121 App. Div. 645.

Turning Corners.

A valued correspondent in dealing with accidents at corners brings up a point which is worth special consideration. His contention is that if in turning a corner one finds a cyclist or a motor car bearing down upon one on its wrong side one's natural inclination is to go over to the left to make room for the man who is apparently about to collide. He is convinced from observations he has made that on the whole it is much safer to keep to the right, as if one once begins to go to the left the oncoming rider or driver, though he may have been on his wrong side when first seen, is in a dilemma, and a collision is almost unavoidable. On the other hand, bysticking firmly to one's proper course the man on the wrong side has a very good chance of changing his direction and avoiding a collision by the simple expedient of going over to his own side. We know that arguments to the opposite effect can be introduced, but we think, considering all things, the safest thing to do is not only to be careful always to turn corners to the right at a reasonable speed, but, having once done this, to keep to the right. It is much safer than cutting out to the left on the assumption that the man on his wrong side will keep on his wrong side. Stop if you can, but do not imagine that you can tell what the other man is going to do. It is far safer to assume that he will turn sharply over to his proper side than it is to assume that if you go on to your wrong side he will keep to his wrong side, and so pass without danger to either.

For Better Chauffeurs.

The standard of the Pittsburg chauffeurs is to be raised, the number of automobile accidents lessened, employers safeguarded and garage conditions bettered generally if the plans of the Pittsburg Automobile Operators' Club are carried out.

The club has about 35 members and is growing rapidly. None but white operators with clear records are eligible for membership. Any chauffeur who has been guilty of misconduct of any kind which would tend to reflect upon the reputation of the craft or who has figured in accidents due to carelessness or inability, will be debarred from membership. There are about 400 chauffeurs employed here and members believe the organization has a bright future.

Nearly all of the automobile dealers in the city are connected with the club and members will endeavor to make the place a clearing house for operators. They will co-operate with employers in securing competent chauffeurs and will do everything possible to have Pittsburg machines manned with competent drivers.

The club grew out of an organization of chauffeurs employed by the Standard Automobile Co. These men fitted up a reading room at the garage, where leisure hours were spent. Applications for membership poured in, with the result that the new club was formed.

A DELIVERY WAGON BODY.

Full Details for Building One for an Electric Commercial Chassis.

The design drawn in perspective shows one of the latest styles used in the delivery service, having a load capacity of 2,000 and a speed of eleven miles per hour with a full load and on a level road thirty-five miles per charge with a full load is considered the average distance on good roads, but it may be considerably less on bad and hilly roads.

The iron frame on which the body rests is made I shape, riveted together at the corners by using corner irons on the outside and inside, which strengthens the corners considerably and makes them stronger than if welded.

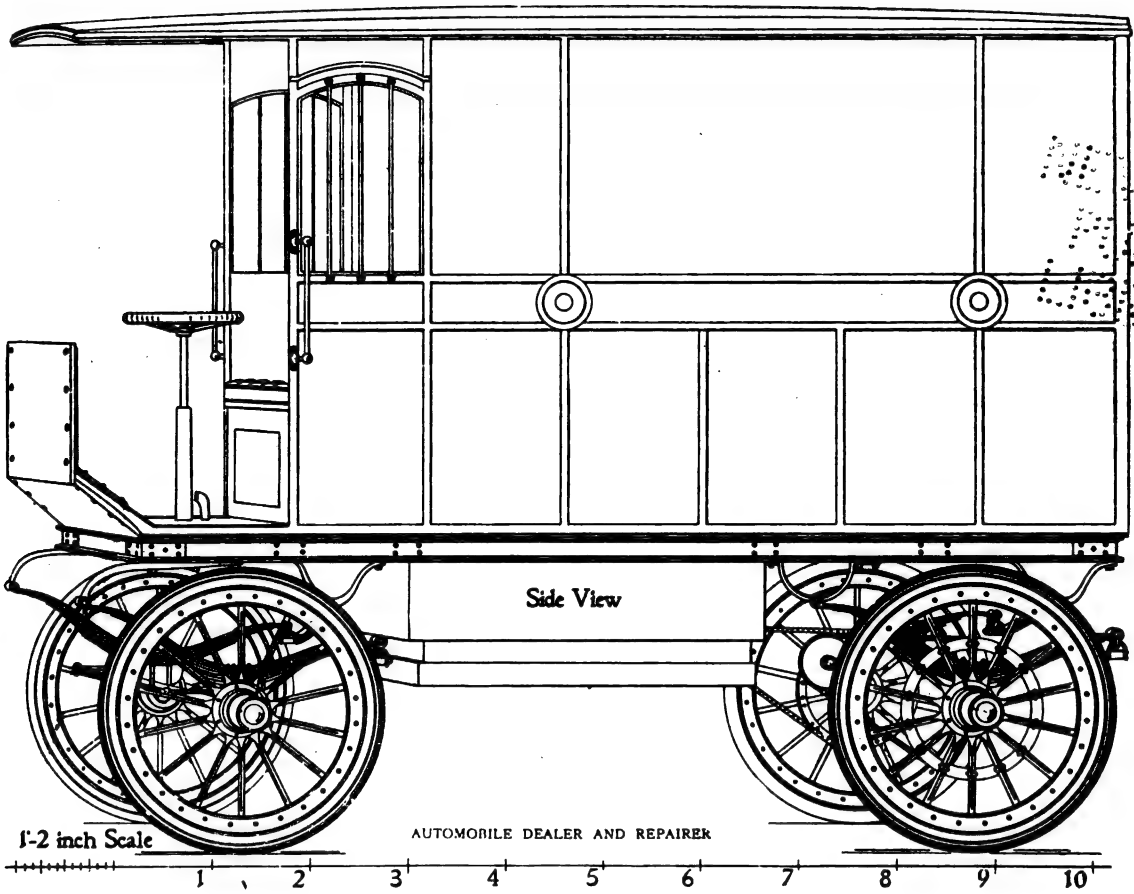
The diameters of the wheels are 36 inches outside and the same height front and back, 3½-inch solid rubber tires, 92-inch wheel base, two motors connected with driving wheels by double reduction gears and individual drains.

The electric commercial chassis is built at the present time with complete running gear battery, controlling apparatus, all electric wiring and is entirely independent of the body, which may be any style to suit the particular business for which it may be used. The chassis is built to carry loads from 1,000 to 10,000 pounds. The construction is such that the battery motors and all other parts for transmitting power to the driving wheels are carried above the springs, or in other words all gear parts including the body have the benefit of spring suspension, which greatly prolongs the life of all the parts and specially adapts the vehicle to the utmost severe service over irregular routes where quick deliveries are required.

The length of wheelbase on this design is 92 inches, the length of I frame 10 feet, and entire length of body 10 feet 10 inches.

The construction of this, or other similar bodies, is extremely simple. All the posts are ripped to size and are ⅞x1⅜ inches. There are ten of them that size, but rear corner posts are 1¾x2½ inches and front posts 1½x1¾ inches thick, same as rear posts, and all are 5 feet 4 inches long.

The moldings on the front posts are solid to the pillars, so as to avoid the joints in front, and therefore the panels must be grooved into the moldings. The outside panels are ⅜ inch thick, the moldings ¼ inch thick; so are the inside panels which run up from sills to the upper belt rail, and posts are ⅞ inch thick, amounting in

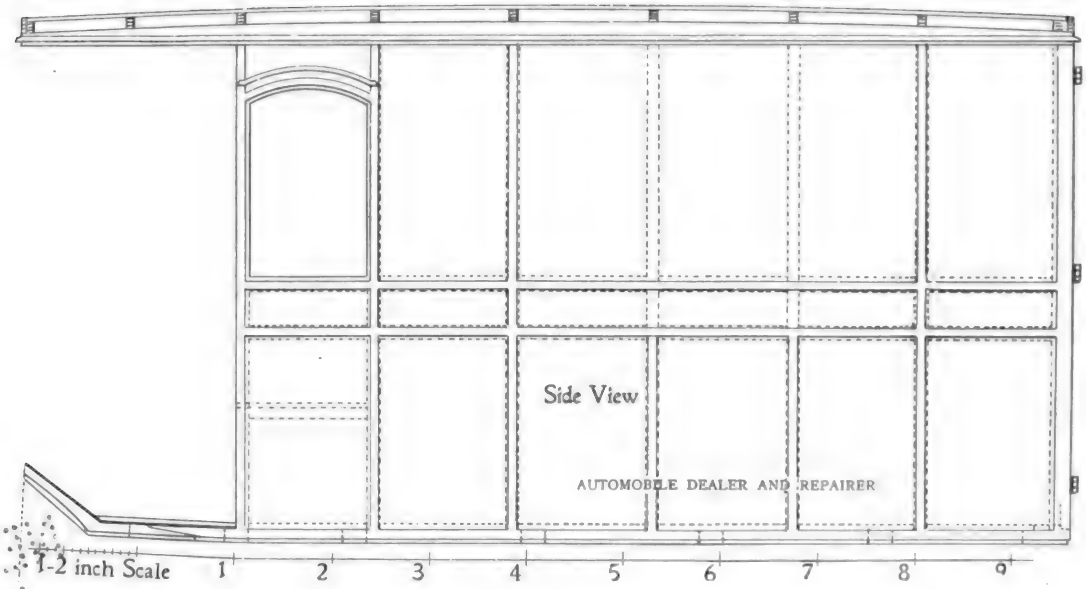


all to 1¾ inches, the thickness of the front posts, therefore, making the inside lining boards level with the front and rear end posts.

The posts are straight from both sides, and when well ripped they do not need to run through the planer. The same holds good with all the rails, sills and cross bars. The four belt rails are the same size as the posts, ⅞x1⅜ inches.

The size of sills is 1⅝x4 inches, the moldings are worked on and panels are put in the groove. All the cross bars are 1⅝ inches thick, except the rear end bar, which is 2 inches thick. Five cross bars are 3 inches wide and each end bar 6 inches wide.

There are six bottom boards ⅝x8 inches; ⅛ inch space at least should be left between each bottom joint. The cross bars are all mortised into the sills and the bottom boards are screwed to the cross bars. The upper edge of the bottom boards is indicated by dotted lines on the side view. The cross bars are shown the same way. The toe brackets are spliced to the sills, between the two front cross bars, as shown by dotted lines on side view. This splice should be made as shown so as to ob-



tain all the possible strength and to keep the water from going into the joints, at the same time adding strength. Fit an iron plate 1/8 inch thick the entire width of the sills from posts to dash, as indicated on the side view. The side rails are lapped into the posts except the end posts into which they are mortised. All the posts are lapped into the top rails. The front cross rail is mortised into the rear corner posts with a 1/4 inch lap on the outside. All top curves are lapped into the top rails. All top boards are 1/4 inch thick with timber used with the least shrinkage, but built-up top panels without any joints in width and length are considered better than jointed panels.

The front seat rests on rails and the seat boards are 1/2 inch thick. Back of the seat is a shifting partition which can be removed when not needed. These partitions are made with stationary glasses fitted directly into it or the glass is fitted into a frame and the frame fitted into the partition, either stationary, to be removed when not needed, or are hinged on each side and open toward the sides of the body.

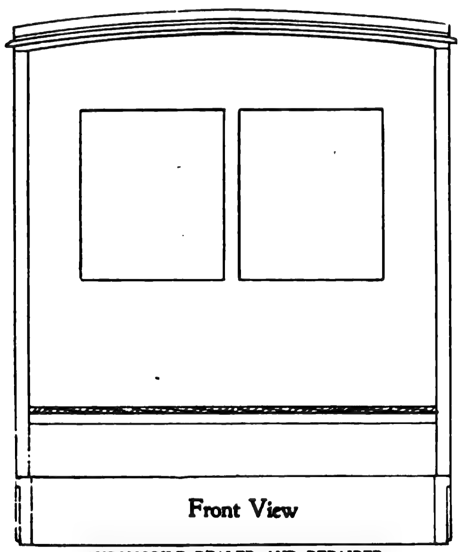
They are also made with glass frames to drop. When made this way the space from the top of the seat up to the cross rail is divided into two parts and the glass frames made so as to drop level with the fence rail. When made to drop the three posts in which the glass frames move up and down are made from poplar, 1 3/4 to 1 7/8 inches square.

These partitions have four locks which fasten it securely in a stationary position, and if not needed the locks are turned with a key, the lock making a smooth surface on the posts. On this draft the partition is drawn with stationary glasses only.

The side windows on the side view have either roll up curtains or glass fitted in stationary, but they also can be made with glass frames to drop. When made to drop the posts must be at least 1 3/4 inches thick instead of 1 1/2 inches.

The rear end has two swinging doors hinged to the corner posts, with three hinges on each side. These doors are built light. All pieces are 1 inch thick, 1 3/8 to 1 1/2 inches wide, except the door posts, which are 1 1/4 inches thick above the belt rails, so that when the panels are glued on it, the entire surface is level for the moldings, which are 1/4 inch thick, making the entire thickness of the door including the moldings 1 1/2 inches. The upper door space is the same as the side windows of the body and is governed by the same conditions as explained above.

All such doors are locked top and bottom with one



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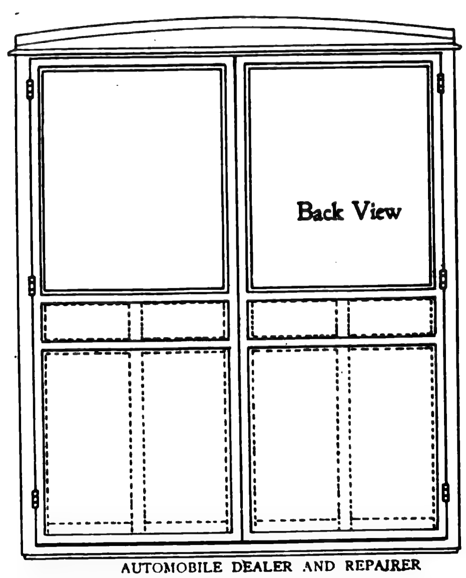
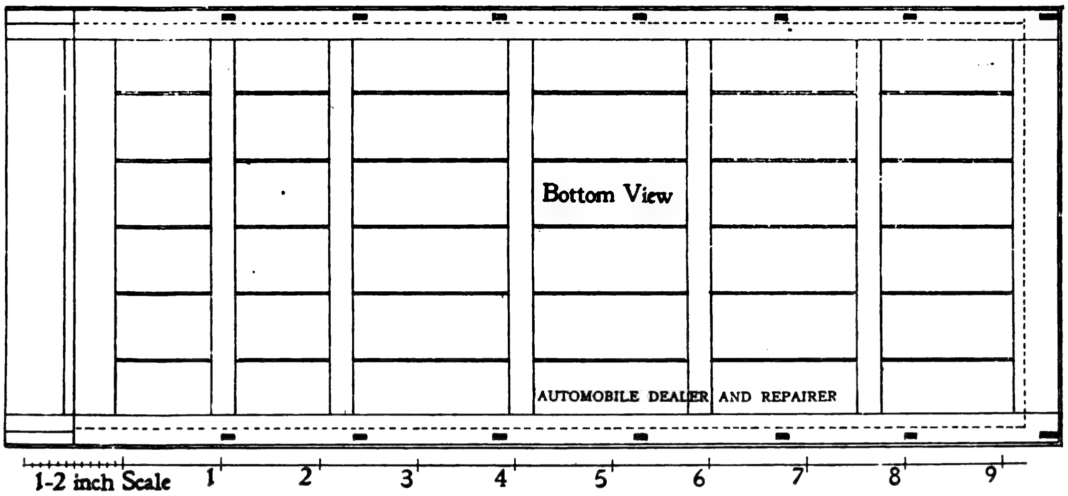


AUTOMOBILE DEALER AND REPAIRER

turn of the handle and all such locks can be bought ready-made to fit any height of door.

To strengthen the body and avoid side motion, fit irons $\frac{1}{4}x1\frac{1}{4}$ inches against the inside surfaces of rear end posts with an eight-inch long corner on the bottom cross bar and the same length on the top cross bar. Those



irons are screwed to the posts, $1\frac{1}{2}$ inches, by No. 16 screws 5 inches apart.

The front posts are strengthened also, but the irons run up to the belt rails only. On the top rails are 7-inch long corners only, running across the front cross rail. The same is done on the upper corners on the front posts.

THE RACE THROUGH ALASKA.

It Is Now Impossible for the Cars to Make It This Season.

The automobile race from New York to Paris is an illustration of a good deal of pluck and confidence on the part of the manufacturers of the cars which are now on their way there. As stated in this magazine two or three months ago, however, the result of the race would depend far more on the men who run the cars than upon the cars themselves.

It is noticeable that among the accessories are ropes and tackle, so that if it becomes necessary to hoist the cars, presumably out of gullies or snow banks, it can be done. Under such conditions we see no reason why, given time enough, a wheelbarrow or any other vehicle may not be taken there.

As to driving a car over that route with its own power, it is entirely a different matter. In our opinion it will be so late before the cars get to Valdez, that it will be impossible to reach the Bering Strait this season. The route must be gone over, if at all, in the winter, and even then it is doubtful if it can be accomplished. The trail as now formed is made by and for dog teams, and is not more than thirty inches wide. Of course, the wheels of one side of the cars must either run one side of it or the other.

On the other hand, if the cars are unable to reach Valdez before the spring begins to have its effect on the snow, it will simply be impossible for them to negotiate the trip. We have seen a horse fall through the snow in those regions after the warm sun had struck it in the spring, and as it was impossible to extricate him he had to be shot then and there.

Just how a car weighing a ton or more could crawl over such a course it is impossible to imagine, unless it be by some outside motor power. Soon after the first of May the entire country is liable to be flooded with water, veritable lakes springing up on the land for miles and miles, making it extremely dangerous to traffic. More than this, there are cliffs to climb and rivers to ford. So far as temperature goes, it is better to attempt to make the trip during the coldest weather than when it gets a little warmer, for cold is never dangerous, although the mercury sometimes gets down to 40 or 60 degrees below zero.

If the feat is accomplished, it will be entirely due to the pluck and resourcefulness of the drivers, the cars and their merits being of secondary consideration.

Several hundred men employed by the United States government toiled for three years clearing the territory stretching over 400 miles from Valdez to the Yukon river. After the trail has been cleared and used for several seasons it is no uncommon sight to see four big army horses struggling to pull a wagon laden with supplies weighing 500 pounds up one of those hills, which average 3,000 feet in length. In April the trail is often flooded to a depth of two feet.

The ice which chokes the river during the winter melts and passes off about the first of May, and the sun shines just enough to melt the snow on the mountain sides. The entire country is subsequently flooded with water, veritable lakes springing up on the land for hundreds and hundreds of miles, making it dangerous to traffic. The formation of a thin shell ice about a foot above the main body of ice that has been frozen to the ground all winter then adds further danger to the traveler. Horses are unable to move through the country while this shell ice is on the passes, as it cuts the animals' legs and feet, and an automobile could never make any progress under such conditions.

After leaving Valdez the contestants will run into the Chigmet mountains, or the coast range, which extends back to the Yukon, traffic here being over the government road. And as for these mountains, they are in some places so steep that they "lean backwards."

Under no conditions can the cars reach the Yukon before the ice breaks up in the spring, even if they ever reach there. This being so, the best that can be done is to spend the summer and fall in that country and resume the trip after next winter is well along.

The writer is sorry to discourage such a unique undertaking, but the facts are as stated.

The following is a table of the distances and a description of the cars taking part in the race:

	Miles.
New York to San Francisco by road	4,300
San Francisco to Valdez, Alaska, by boat	2,800
Valdez to Nome, Alaska, by road	1,200
Nome to East Cape, Siberia, by boat	250

East Cape to Paris by road	11,450
Total distance	20,000

AMERICA—60 h. p. 4-cylinder Thomas. Drivers, Montague Roberts and Harold Brinker. Weight, 2,600 lbs.

FRANCE—30 h. p. 4-cylinder De Dion. Drivers, St. Chaffray, Austran and Capt. Hansen. Weight, 6,613 lbs.

FRANCE—24-30 h. p. 4-cylinder Moto-Bloc. Drivers, Charles Godard, Arthur Hue, R. Maurice Livier. Weight, 6,437 lbs.

FRANCE—15 h. p. 1-cylinder Sizaire-Naudin. Drivers, August Pons, Maurice Berlke and Lucien Dechamps. Weight, 3,307 lbs.

GERMANY—40 h. p. 4-cylinder Protos. Drivers, Ernst Maas, Hans Knape and Lieut. H. Hoeppen. Weight, 6,000 lbs.

ITALY—28-40 h. p. 4-cylinder Zust. Drivers, Emilo Sirtori, Henri Haaga and Antonio Scarfoglia. Weight, 3,527 lbs.

Beauty and the Beast.

The illustration, which is a clever conceit of the White Steamer Company at the recent Automobile Show in Cleveland, shows a 1908 White runabout, powerful, clean cut, well-groomed and up-to-date.

The young lady in the car is attired entirely in white and speaks for herself. The dog is a blue-ribbon bulldog, valued at $800. The picture has been appropriately entitled "Beauty and the Beast," and the occupants of the car are evidently and appropriately aware of it. The young lady knows, or rather cannot help knowing, that she is a beauty, and the bulldog shows by the expression on his countenance that he is disgusted because he is a beast.

The White car, it is pretty well admitted, is at the head of steam cars everywhere, and is always sure to give a good account of itself at any kind of a competition with gasoline cars.

An Economy Run.

The recent economy run of automobiles on Long Island is something that dealers should make good use of. It shows conclusively that the expense of running automobiles is much less than the cost of railroad fare and far less than that of horse-drawn vehicles.

The table which we give below showing the official figures of the results of the contest, is not conclusive by any means, but in comparison with railroad travel it is certainly extremely suggestive. The trial took place at a season when the roads were in almost the worst possible condition of the whole year, and the cost would have been very much less if the highways would have been in their normal condition. Twenty-three cars started in the contest and nineteen finished within the time limit. The other four retired because of mishaps on the road.

The railway fare for the trip is $5.28. The record of the gasoline and lubricating oils consumed show that ten cars made the run at a cost of less than $1.00 per passenger, four made it for less than $1.50 per passenger and four others made it for less than $2.00, and one ran at a cost of over $2.00 per passenger.

Now, as to this record, it may be stated that the highest cost, that of the six-cylinder Acme car, might have been much reduced if one or two more passengers had been carried, which seems to us might easily have been done. Possibly the same remarks might be made in reference to

BEAUTY AND THE BEAST.

some of the other cars, but we are inclined to think that the Acme made the most palpable mistake of not taking more than four passenger when five could have been carried easily with a car of this high power. It appears from this paper that the Frayer-Miller car took first prize and the second prize went to the Franklin car.

Now we wish to repeat that judging from the table given, this race was not a correct gauge of the comparative merits of the various cars taking part in the contest. Of course, a good deal depends on the drivers themselves, possibly even more than upon the cars. The official figures are as follows:—

	Gasoline, gallons.	Oil, quarts.	Total cost.	Passengers.	Per capita cost.
Frayer-Miller	13.000	1¼	$3.56	5	$0.71 1-5
Franklin	9.875	2½	3.10	4	77½
Pullman	13.125	2½	3.91	4	78 1-5
*Maxwell	14.935	1	3.98	5	79 3-5
Pope-Hartford	14.000	2⅛	4.03	5	80 3-5
Am. Mors	21.125	4⅝	6.44	7	92
Pope-Hartford	14.875	4½	4.85	5	97
†Winton	26.375	⅞	6.82	7	97 3-7
Acme	25.50	2	6.88	7	98 2-7
Thomas-Detroit	15.218	4½	4.93	5	98 3-5
Rambler	15.937	3⅛	5.01	5	1.00 1-5
†Acme	24.875	3½	7.10	7	1.01 3-7
Lozier	27.75	8½	8.07	7	1.15 2-7
Maxwell	22.50	1½	6.00	5	1.20
Cadillac	18.25	9¾	6.00	4	1.50
Mora	16.000	8⅛	5.03	3	1.67 2-5
Studebaker	27.75	6⅜	8.53	5	1.70 3-5
†Stevens-Duryea	29.50	5⅝	8.78	5	1.75 3-5
†Acme	30.375	3¾	8.53	4	2.13¼

*Two-cylinder car. †Six-cylinder car.

Making Tires Last Long.

Tires should not be stored or left off any length of time unused in the direct rays of the sun or kept in dry, warm quarters. Under such conditions the rubber quickly loses its elasticity, becomes hard and soon develops innumerable little cracks. A continued exposure as above will render the best tire practically valueless in a few months.

Never allow your tires to stand in oil at the garage or elsewhere, and be particular to wipe off any oil which may drop on the tires at any time.

If the car is jacked up and supported on horses (which can be made very cheaply), it will add greatly to their life, as the tires are then bearing only the pressure of the air with which they are inflated. Whereas, when supporting the weight of the car, this weight, often several thousand pounds, is exerting a continual, unnecessary strain on the casing walls.

When using your car always keep the tires pumped up until there is no perceptible depression where the tire touches the floor when the car is without passengers. Imperfect inflation is responsible to a greater extent than perhaps anything else for "blow-outs" and quick disintegration.

When the thread wears down so the fabric is exposed the tire should be immediately removed and sent to the factory for retreading. Otherwise the fabric will soon be destroyed and the tire permanently injured in consequence.

If you find what you want here, please tell your friends about it.

Repair Expense.

The idea that the cost of repairs for the modern and well-made automobile exceeds that of any other vehicle or machine that undergoes hard use is erroneous. The wonder is that cars go wrong so seldom, not that they break down so frequently. Take the case of one car that may be named as an example of a score or more of others, for illustration—the Elmore two-cycle valveless car. From a list of Elmore owners in Detroit sixteen persons were selected for the purpose of investigating the maintenance expense. These sixteen persons traveled 132,650 miles, and in covering that distance expended all told for up-keep expenses $26.95. The persons selected by the Detroit agents were representative automobile owners, and absolutely no knowledge was had by the agents as to what mileage had been done or what the expenses were, when they selected the names of the owners who furnished them with this information. The list, just as compiled, is shown herewith, and if any doubts exist as to its veracity, they can be set aside by communicating with the owners.

Owners.	Miles.	Years in use.	Repairs.
Dr. E. B. Smith	12,000	1	$1.05
Dr. E. S. Kiskadden	6,500	1	.05
Charles W. Munz	4,800	1	.50
Dr. F. W. Young	5,000	1	.10
John H. Smith	8,500	2	.75
Miss Mabel Wright	7,200	1	1.35
W. H. Allen	7,000	1	1.60
W. F. Barr	4,750	1	1.10
M. Caley	8,000	1	1.00
John Trost	8,200	1	.50
F. Peckencher	10,000	2	5.75
Mat. Heldrath	6,200	1	.25
J. J. Miller	18,000	2	5.90
Perry Hibbard	3,500	1	.50
Thomas H. Van Loch	14,000	3	4.75

The Carter Cars.

R. A. Palmer, secretary of the Motorcar Company, builders of the friction driver Cartercar, states that business has picked up wonderfully fast in the automobile line during the past few weeks. Their factory is running with full force now, and from every indication will be behind in orders inside of a month. Agencies are being closed rapidly in every section. Some of those who have signed up for the Cartercar line during the past week are as follows: Smith, Clemens & Hopping, of Dayton, Ohio; Knowles & Rowland, of Demming, New Mexico; Parker & Heugerbaugh, of Ashtabula, Ohio; Indianapolis Auto Co., of Indianapolis, Ind.: Naperville Garage, of Naperville, Ill., and Johnson's Auto Co., of Boone, Iowa.

Motorcycle Speed.

Recently, at Daytona, Fla., W. H. Wray, Jr., on a two-cylinder Peugeot Motorcycle of fourteen horse power, made the world's record of fifty and two-fifths seconds for one mile, from standing start. This beats the previous record by about three seconds. During the preliminary trials Wray made a mile, flying start, in forty-six and two-fifths seconds, and with a single-cylinder three and one-half horse power Peugeot Motorcycle he drove several miles at a speed slightly under sixty-three seconds, unofficial.

If you don't see what you want, ask for it.

AUTOMOBILE DEALER AND REPAIRER

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ADVERTISING RATES MADE KNOWN ON APPLICATION.

NEW YORK, MARCH, 1908.

Missing Numbers—Our readers are requested to remember that it always gives us pleasure to re-send numbers which have gone astray in the mails.

TIME TO SELL CARS.

Disguise it as we may, the larger share of those who now own automobiles and a still larger share of those who will own them will do so because they are the best for a given amount of service, and will do this service cheaper than horse-drawn vehicles. Of course, there are and always will be some who use automobiles because they are enamored of speed and other considerations and care nothing for expense.

The great mass of people, however, will use them because they are the most economical of vehicles, and this is the class that automobile dealers should cultivate and seek out at the threshold of this coming season. There are scores of such men in any locality, who perhaps have never given the subject of an automobile more than a passing thought, but if the matter were comprehensively presented to them in all its varied aspects they could easily be induced to buy a car.

As a rule this class want cars worth not more than $1,000. There are hundreds who can afford them at this cost, where there are not five who can afford one that costs $3,000, and there will be hundreds of these cars sold before long where there are not five of the higher priced cars.

Dealers and repair men should get busy at once and find out who in their locality are likely to want such cars as these and show them why it will be a matter of economy for them to purchase them. The field is ripe for the harvest.

It should be also shown that there is absolutely no expense in maintaining an automobile when not in use, while there is a constant and steady expense in maintaining an idle horse with a carriage. This in itself is a decided advantage to many who perhaps have use for a car only once or twice a week or possibly even less than this.

Among the various kinds of cars that are within this price there is probably not a single one that is superior in all ways to all others. Some have a good many points and others not so many, it is true, but no single car has all of the good features. Thus the matter of what car is sold is not of so much importance as it might seem. Moreover people themselves are different. If we were all of the same taste and of the same opinion, this world would be very much different than what it is now; but as there is a great variety of tastes, so there is a demand for a great variety of cars.

During the next ninety days there will probably be more cars sold than during the entire balance of the year.

CHARGES FOR REPAIR WORK.

In reply to requests for information as to what are fair charges for automobile work, we are reminded of an instance that not long ago came within our own knowledge. A young woman went abroad for the first time and, reaching Paris, was suddenly stricken with blindness in one eye. Of course she was much frightened and went to a well-known eye specialist there, who examined her eye for a moment, and then, in an instant, with some suitable delicate instrument, did something that restored the sight. When the young woman asked him what the charge would be, he named one thousand francs. This gave her almost as much of a shock as the loss of sight at the outset. It was more money than she had at hand. She was compelled to cable home for funds, for the eye specialist would not reduce the bill, remarking when requested to do so, that five francs onl as charged for doing the work, and the other nine hundred and ninety-five francs was the very low price for "knowing how."

This method is equally applicable to the repair of automobiles. In the case of a difficult job, something should always be charged for "knowing how." And no car owner who places a proper estimate upon the value of his car and upon its care and satisfactory running qualities will refuse to pay for such knowledge.

On the other hand, a repair man who does not "know how" is liable to do more injury to the car than if he had never touched it.

The repair man who does not learn all about cars, and thoroughly understand cause and effect, is not fit for the business, and the sooner he leaves it and gives some worthy man a chance, the better both for the car owner and himself.

HOW IT DEVELOPS.

After all, the development of the automobile to date has been largely a matter of experiment and of the test of experience. Where a part has proven itself too light it has been strengthened, where too heavy it has been lightened, where too long it has been shortened, and where too short, lengthened.

Take the case of wheels likewise. At the outset, wheels of the same as those of horse-drawn vehicles were used. But difficulties, or rather objections, quickly developed; there was the difficulty of reducing speed from the engine to road wheels without much frictional loss, there was the cost of the pneumatic tire, and then the cost and difficulty of building a wheel of this size of sufficient strength. But the smaller wheel offered objections also. It is more conducive to shocks; it goes harder on rough roads, and it is more liable to skid. So there has been a compromise, and something between the two extremes will probably be a finality.

But it is doubtful if with all the experiments and the tests of experience that the manufacturer yet comprehends how much easier a light tire runs than a heavier one. Or we will put it this way: It is doubtful whether the average manufacturer knows how much weight he

can add to the center of the wheel and not add to its traction force, or how little weight he can add to the periphery of the wheel without adding much to its traction force.

LOW PRICED CARS.

For some reason not immediately plain, the low priced cars of the simple carriage construction pattern do not sell in the East as it might be thought they would, and we doubt very much that they sell in the West to the extent their merits deserve.

They are worth the money asked for them as a rule and one reason for their slow introduction must be because the common pattern of high priced cars causes what is now considered a very unfavorable comparison. Custom in vehicles is something like custom in other things, it often clings to the backs of the public like the "old man of the mountain." People are something like sheep, they usually run in the same direction, and all together, when possible.

While the high priced car is undoubtedly the thing for the man of means who could formerly afford coaches and horses in abundance, the simple and low priced runabouts should be far better represented among the great middle class. Possibly this is due to the fact that they have not been pushed by dealers as much as they deserve. Of course the profit in the sale of one such car is not a tithe of what it is in the case of a $3,000 or $4,000 car. Moreover, cars themselves are their greatest advertisements. The ordinary high priced cars are now seen on almost every highway and no one has to have his attention drawn to them. On the other hand the low priced high wheeled cars are seldom seen and attention is not called to them as generally by those interested as it should be.

When we speak of a low priced car we mean a car that sells for from $400 to $800. Anything at a lower price than this would hardly be substantial or practical. The vehicle part—meaning the part not included in the engine—of an automobile must necessarily be more substantial than that of an ordinary carriage. It is subject to far harder usage. It must carry—reckoning the engine and the transmission—two or three times more weight than the ordinary vehicle. This being the case no one should expect to get a substantial and reliable automobile for less than about $400, when a far simpler and less substantial carriage costs half that sum.

It goes without saying that if the automobile is to ever come in general use, as it undoubtedly will, it must be pushed within the reach of the great middle class—for the well paid mechanic as well as the farmer and ordinary business man. It is far more desirable than the horse drawn vehicle, because when it is not in use there is no expense attached to it. But such a car must be adapted to the needs of a man of moderate income, must be simply and easily controlled by a man of ordinary mechanical ability and experience, and it should not be necessary to take it to the repair shop oftener than the horse drawn carriage goes to be repaired.

SAFER ROADS FOR AUTOMOBILES.

What is this we hear about Massachusetts? An automobile not a carriage and not entitled to the same consideration and subject to the same penalties, as well as all other carriages? It appears that someone whose car was damaged in that state, owing to a defective highway, was refused redress in the local court on the ground that an automobile was not a carriage in the usual meaning of the term.

According to our information, the court held that although the highway might be safe for an ordinary vehicle the town is not called upon to make it safe for an automobile. If this is logic and law automobile owners ought to know it, but it is certainly contrary to all precedent and previous information.

In practically all of the states the municipalities and towns or townships are made responsible for injuries resulting from the unsafe condition of the highway. The liability is usually prescribed by statute, and the extent of liability is defined by the statute creating it. Where a statute provides that highways shall be kept in a reasonably safe condition for travelers with horses, teams and carriages the word "carriages" includes motor cars or automobiles. It has been held that in an action for injuries from a defect in the highway the question was not whether the town used ordinary care in construction and repair of its highway, but whether as a result the road as constructed and maintained was in fact reasonably safe for travelers. But the duty of a municipality to keep its highways in a reasonably safe condition does not include providing against insufficiency caused by extraordinary events.

This latter sentence might be deemed as applying to automobiles alone, but an automobile cannot be considered anything extraordinary in these days, and no doubt it will finally be settled that it is as much the duty of a town to provide reasonably safe roads for an automobile as for other carriages.

PUBLIC BENEFACTORS.

Some time ago the writer heard a good clergyman preach an eloquent sermon in which he extolled the virtues of economy. He said that he occasionally went into the homes of some of his poorer flock and was surprised to see the things there which were entirely unnecessary. Then he proceeded to state that many could get along with cheaper quality of carpets on their floors, that the woman of the household need not have a stylish hat or bonnet quite so often, and that the men and boys might wear clothing that was more durable, yet not quite so high priced and stylish, and still be quite as comfortable in every way.

Not to attempt any report of the sermon, it may be said it was a comprehensive plea for greater economy and less expenditure on the part of the masses of the people.

As the clergyman left the pulpit quite a number of his parishioners came forward to grasp him by the hand and to thank him for his good advice, remarking what a good thing it would be for the masses if they followed it.

But would it? Suppose everybody in the country were to curtail their living expenses to the extent, say, of 10 cents a day, this would amount to the stupendous sum of $2,920,000,000 a year. And with what result? Why, factories would have to reduce their output to just their proportion of this sum, transportation facilities would be obliged to suffer their proportion of the loss, and the retail store business would find their business reduced for their share. All this with a curtailment of a matter of $36 per year a family.

The fact is that while the clergyman's advice was well enough in case of the single individual, it is all pernicious nonsense as applied to the entire nation; and this is another instance of where the direct welfare of the individual often runs contrary to the ultimate interest of the whole.

And if it be worth anything to have the manufacturing

industries of the country thrive, then every man who buys a coat or a pair of shoes, and much more an automobile or a piano, is a public benefactor. He is doing something for his community and for the country. As compared to the class which hoards and lives in a "cheese-paring" way, he is of the "better class."

We are quite well aware that this is not according to the teachings of a certain school of political economists—and this is just why we go out of our specific work of writing information to automobile dealers and repair men to express it.

NOW SELL CARS.

Now is the time to sell cars. Get busy. But if you have not got the entire subject at your finger's ends, so to speak—if you are not prepared to answer every objection and every question that may be offered by the man "from Missouri," who must be convinced—you will not succeed.

You must be able to state with assurance the cost of running a car, the amount of work it will accomplish in comparison with the horse, the deterioration and the ease of running.

We are so confident of the ultimate prevalence of the automobile that enthusiasm is pardonable. Do not wait for the prospective buyer to consult others or write for catalogues. See the man yourself. If he does not buy a car, and of you, you have only yourself to blame.

As to the kind of car you should sell and recommend, we leave that to the judgment of the dealer and the purchaser. There are scores of good ones. The only essential after the car has been sold is that the purchaser should know how to take care of it and run it, just as the owner of a horse should care for it in order to get the best out of it. This guaranteed and the purchaser will be satisfied.

MORE TROUBLE WANTED.

We are glad to state that many readers responded to our request two months ago to give us particulars of their troubles with their cars. Right here we want to say that subscribers have it in their power to make this publication the best one in its line in the world. If each one when he encounters a difficulty, will write it out and send it to us for publication, even though it might not occupy more than a dozen lines, it will be of assistance to somebody.

If a reader encounters a difficulty that he cannot surmount and wants to know how to do it, let him describe it and he may be sure that some other reader who has met with the same trouble will be able to solve his problem for him.

This appeal is made to every reader. Don't think that somebody else will attend to it and that what you may have to say is of no importance, but say something yourself.

AIR AND WATER COOLING.

It is a good idea to keep an eye on the air-cooled cars. Either this system is superior to the water-cooled system or it is inferior. Anything of this kind can hardly be a matter of taste or sentiment. On the one hand, the water-cooled idea is the one most generally in use, and on the other, the air-cooled system has given a good account of itself, so to speak, in economy contests. At the Long Island club's recent contest, two air-cooled cars head the list in the awards, although water-cooled cars follow so closely that nothing was completely proven. In any of these contests, the driver must be considered as an important factor.

Another consideration in the case of the air-cooled car, is that it may run all right with a small engine and on a cool day, but how about a large engine and a hot day?

If any of our readers have formed an opinion, based upon experience or knowledge, of the comparative merits of the two cooling methods, we should like to hear from them.

A Word for the Friction Drive.

"While the automobile business has grown to proportions undreamed of a few years ago, it is an interesting fact," states R. A. Palmer, secretary and general manager of the Motorcar Company, makers of the friction-driven Cartercar, "that nearly all of the important changes and improvements have come from Detroit manufacturers.

"In the very earliest days of the industry the old 'one-lungers' created a stir and attracted the attention of the world to Detroit by their advertisements picturing the horse in tears looking over the country fence while these cars sped by. Then came the touring cars. The finest and best the world has ever produced. Cars that have burned gasoline and covered the roads of every country on the globe.

"The last improvement, however, was the invention of the friction drive, which did away with multitudes of troubles for the motorist. Like many other changes, it was ridiculed and criticised severely when exhibited for the first time at the Detroit show in 1906. But those who ridiculed at first have now changed. At the recent Chicago automobile show twenty-one friction driven cars were exhibited.

"I believe the day is not far distant when practically every machine will use some sort of friction drive. I base my belief on the fact that simplicity is necessary to the easy operation of an automobile. The friction drive gives this simplicity because it eliminates the clutch, gears, the necessity of grease packing and the constant anxiety that gears may be stripped in a tight pinch."

The Quality of Oil.

The quickest way to determine the quality of an oil for automatic cylinder use is by the color test. The technical jargon of viscosity, fire test, specific gravity, etc., is unintelligible to most automobilists who know only that what they want is oil as free from impurities as possible. It is a well-known fact that the hot gases in the cylinders burn up the oil, which then deposit a residue of carbon. This carbon deposit is responsible for an endless variety of engine trouble. It is only by a process of filtering that mineral oils can be freed to any extent from the impurities natural to them. The more the oil is filtered the less impurities it contains and consequently the less carbon it will deposit and the lighter and clearer in color it becomes.

The motorist who wants an oil best adapted for cylinder lubrication cannot make a mistake if he picks out the oil which is of a very light amber color. The red or ruby oils are not quite as free from impurities as the amber-colored oils, but are far better than the brown or black.

A handy tool for a private garage is a new portable electric drill, which may obtain enough power from an ordinary incandescent lamp socket. Emery wheels also may be attached, and it makes a perfect polisher for lamps and metal work.

If you don't see what you want, ask for it.

THE REPAIR SHOP

SECOND HAND CARS.

How and Why They Are Often on the Market, and How They May Be Put in Shape for Use.

The customer often relies upon the motor-vehicle repairman to decide upon the merits of a prospective second-hand machine. Frequently the judgment of the expert is of considerable value to the novice and the latter is willing to pay for it. I am acquainted with repairmen who have saved money for persons who were considering the possibilities of buying a certain second-hand machine. The trained eye of the repairman would detect

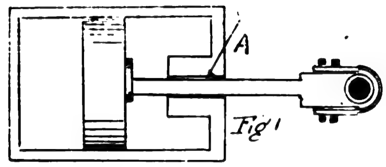


Fig 1

the flaw in the machine and the buyer would be advised of the defect. Often the party selling the machine had been offended at the report of the repairmen on the condition of a machine which has been placed on sale. The average repairman is honest when it comes to fixing the value and practical worth of a machine for a patron. Usually the customer resides in the vicinity and the repairman knows that he will have the machine in his shop when it is in need of fixing. In fact, some of the shops depend entirely upon regular patronage of customers who live near. The addresses of these people are re-

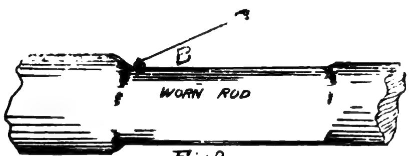


Fig 2

tained, and regular visits are made to the garages to inspect the cars.

The second-hand machine is put on the market for divers reasons, and the repairman holds them all in mind when he is bargaining for a customer or for a venture of his own. There may be something wrong with the machine. There is always a reason why some one desires to sell.

But it does not always follow that the machine itself is out of running condition. Perhaps the "wrong" thing

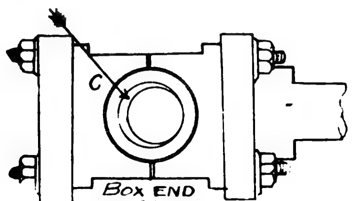


Fig 3

revolves itself into the question of finance of the former owner. Perhaps the owner could not afford to hire a man to run the machine and therefore decided to sell. The mechanical part of such a machine is not wrong. Then again people move often and sometimes long distances, and they cannot very well carry their cars, and often a car is sold simply because the owner is going to cross the seas. Then again men die and owners of automobiles are not exempt, and if the father or son of the

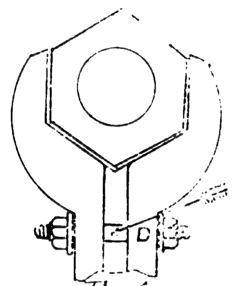


Fig 4

family who was interested in the car passes away, the chances are the machine goes under the hammer or at private sale. There can be nothing wrong with the machine, in the sense of the phrase that the car is sold because there is a flaw in its mechanism or design.

On the other hand, machines will wear out. The life of all machinery and of all vehicles is limited. Hence the repairman can use his skill in detecting the worn parts. If is is simply a bearing that is worn, a new bearing can be substituted and the car made like new at that point. Then there are machines with good and bad names. I know of a car which was sold because of the numerous accidents it had in its record. People were afraid of it. Then there are machines on sale simply because the owners wanted to get one of larger capacity and greater power. Then we find machines in the sale shops of automobiles simply because the lady did not like the design. The color of the car can be altered, but not the general pattern, without much expense. Hence the car is sold and some one gets an opportunity to get a bargain, for many will say the car is sold because there is something the matter with it and the price thus runs low.

The expert has some problems to decide, but if there is really something wrong he can detect it. Of course he will examine the cylinder first. If by turning over the

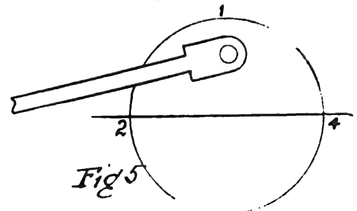


Fig 5

wheel so as to get at the condition of the balance and the setting of the rod in the bushings of the cylinder head he finds that the rod is worn at A in Fig. 1, and that the rod slips and rattles, he can locate a flaw, but one of a character that can be remodelled. The rod may be worn at the sliding surfaces to the extent of forming shoulders as at B in Fig. 2. A new rod can be replaced at light cost and the principal flaw in the car fixed. Or the engine may rattle and shake so badly as to make even running an impossibility. The original owners may suppose that the general wear on the engine is the cause

and they may think that the life of the car is about finished. The trouble may be due to the wearing of the box end stud, or to the ring packing of the bearing of the box proper so as to leave a void as at C, Fig. 3. Such a defect can be fixed speedily with new parts and the tremor of the engine overcome.

Often cars are put out of temporary commission by as little a thing as the use of a flat S wrench of the nature

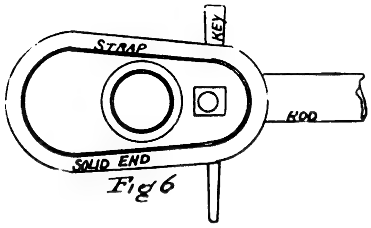


Fig 6

shown in Fig. 4. For convenience these light wrenches are carried in the kit box. The jaws are held by the bolt D. For light work the wrench is good. But on heavy work the jaws slip and the nuts get rounded off on the corners. Tightening of the nuts cannot be done thereafter and the result is that the parts work loose. It is best to have a good strong monkey wrench in the kit box.

The cross head, Fig. 5, shows the plan. The strain and consequently the wear is from the crank to the pin on the wheel. You can get your balancing of the engine by this plan. The weight is often off. This can be fixed. If the connecting rod and attachments weigh a certain

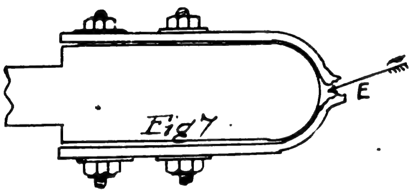


Fig 7

amount, then an equal weight applied at 2 will balance 1 in a vertical direction. In order to complete the balance, metal clips can be added or removed at the points designed by the numbers completely around the circuit. I have seen very poorly running machines put into good order by regulating the balance of the wheel. Often pieces of sheet lead are pinned on for a balance. A helter skelter engine is frequently put into even running service by this mode.

Then we have the crank ends. A solid end is shown in Fig. 6. Look to the keys. Often they wear off and slip. Drive them up a little firmer and take up the slack. If the strap is broken as at E, Fig. 7, a new strap is of

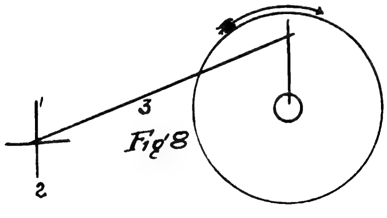


Fig 8

course the remedy. I saw a case in which a broken strap was all that was wrong with the motive power of a car.

Fig. 8 shows the strain on the cross heads. The strain is from one to two as the whole pressure on the piston rod as the angle of three is to ninety degrees, and is either upwards or downwards, according to the friction of run of the engine. You can look for wear in accordance with the straining direction. You can take up the wear with the adjustable boxes or by use of packing or keys, as the case may be. Perhaps new bearings will be needed or a complete new shaft with crank. The little wrongs of a car do not condemn the whole car, as all repairmen know.

HORSE POWER OF GASOLINE ENGINES.

Rules for Obtaining Estimates, with Data Concerning Two and Four-Cycle Engines.

BY JAMES F. HOBART, M. E.

An "Old Subscriber" writes that he has two gasoline engines, one an opposed cylinder, four-stroke cycle, 6-inch bore and 4½-inch stroke. The other engine is evidently a two-stroke cycle double cylinder concern, 4½-inch bore and 5-inch stroke. He wishes to know the horse power of the two engines when running at 450 revolutions a minute. He also adds that he is unable to get more speed from the twin-cylinder vertical engine, which is in his launch, and evidently connected to a 24-inch propeller wheel, and wishes to know what size of screw would be better than the 24-inch he is using, and also desires to know how fast the four-stroke cycle opposed cylinder engine should be able to run, probably connected with the propeller in place of the two-stroke cycle engine, although the gentleman does not expressly state that connection.

The amount of data furnished wherewith to answer the questions above noted is exceedingly meager, and a lot of it will have to be assumed. In order to calculate the horse power of a gasoline motor, or any other reciprocating heat engine, it is necessary that the mean effective pressure be known, then the problem is an easy one, and the formula:

$$HP = \frac{PLAN}{33000}$$

In this equation the quantities represented are as follows:

Name and Symbol.	4-Stroke.	2-Stroke.
Length of stroke........$=L=$	$4\frac{1}{2}''=.375'$	$5''=.417'$
Area of cylinder.........$=A=$	28.27"	15.9"
Number of strokes......$=N=$	225.	450.
Pressure (mean effective)$=P=$	?	?
Horse power..........$=HP=$	?	?

Had the indicator been used and the mean effective pressure been noted, then the HP could have been figured at once. Note that the number of strokes is the number of power strokes, always, and that it is 225 in one engine and 450 in the other because the four-stroke cycle engine gives an impulse every fourth stroke, or every other revolution, while the two-stroke cycle engine gives an impulse every revolution. Only one of the cylinders in each engine is figured in the above noted statement.

The mean effective pressure in gas engines ranges somewhere about 70 pounds to the square inch, and, assuming that $P=70$, the formula $HP=\frac{PLAN}{33000}$ becomes as follows, for the two types of engine:

$$HP=\frac{70\times.375\times28.27\times225}{33000} \qquad HP=\frac{70\times.417\times15.9\times450}{33000}$$

Solving these equations, the horse power is found to be as follows:

$$HP=5.06 \text{ and } 6.32.$$

But the pressure, or MEP, as "mean effective pressure" is usually abbreviated, is affected by so many things in gas engines that it is well to assume the several items and then calculate the mean effective pressure instead of assuming outright a value for that quantity.

The rule given by Hiscox for obtaining an estimate of

the power of any gas engine when an indicator diagram is not obtainable, is as follows:

Multiply the initial pressure by the compression ratio and subtract the product from the compression pressure; divide what is left by 140 and call this number "a."

Multiply the exhaust pressure by the expansion ratio and subtract the product from the explosion pressure; divide what is left by 120 and call this number "b."

Subtract number "a" from number "b" and multiply the remainder by the number of explosions per minute and by the clearance volume and divide the product by 1,000.

Expressed as a formula, the rule becomes:

$$HP=\frac{E\,V_3}{1000}\times\left[\frac{P-p_5\,r_5}{120}-\frac{p_3-p\,r_3}{140}\right]$$

It now becomes necessary to look up the several quantities indicated by the letters in the formula, and to see how many of them must be calculated or assumed. The symbols and the quantities they represent are as follows:

Cylinder diameter	C
Cylinder area	A
Piston stroke	L
Cylinder volume	C
Cylinder clearance	V_3
Cylinder vol. + clearance	V
Pressure after compression	p_3
Pressure before compression	p
Ratio of compression	$\frac{V}{V_3}=r_3$
Pressure of explosion	P
Pressure of exhaust	p_5
Ratio of expansion	r_5
Number of explosions	E
Expansion volume	⅞V

Inspection of the above list reveals that while some of the quantities are known, others will have to be found as best they may, and the method followed by the writer is as follows, using the tables prepared by Hiscox, Donkin and others:

Cylinder diameter, given: C=6" and 4.5".

Cylinder area, obtained from diameter: 6×6×.7854=28.27 and 4.5×4.5×.7854=15.9, respectively.

Piston stroke, given: 4.5"=.375 foot, and 5"=.417 foot.

Cylinder volume, area × stroke: 28.27×4.5=127.23, and 15.9×5.=79.5.

Cylinder clearance: Assumed to be equal to 41% of the space swept through by the piston, or 127.23×.41=52.2, and 79.5×.41=32.59.

Cylinder volume plus clearance: 127.23+52.2=179.43, and 79.5+32.59=111.93.

Pressure after compression: p_3. The tables give for a ratio of compression of 3.45 with admission at 13.2, a pressure of 69.8 pounds. At 14 pounds, the tables indicate that the pressure would be about 73 pounds absolute, reckoning from vacuum for this and for all other pressures noted in these calculations.

Pressure before compression: p. Assumed as 13.2 in the four-stroke cycle engine, and as 14 in the two-stroke cycle machine. As air at normal pressure is at about 14.7 pounds pressure, it is estimated that there would be a loss of pressure occasioned by drawing the charge into the cylinder through the passages and through the carburetter. In the two-stroke cycle machine the loss of pressure is not as great, as the incoming charge is under a slight pressure during its passage to the cylinder, hence it is taken as 14 pounds as stated.

Ratio of compression: $\frac{V}{V_3}$ or r_3, obtained by dividing the cylinder volume, including clearance, by the volume of clearance, thus: 179.43÷52.2=3.45, and 111.93÷32.59=3.4.

Pressure of explosion: p. This is found by means of the formula $P=\frac{p_3\,T}{t_3}$ in which

P=Explosion pressure.
T=Explosion temperature.
p_3=Compression pressure.
t_3=Compression temperature.

The compression pressures p_3 have already been taken at 69.8 and 73 pounds. From a table of temperatures due to the explosion of a fresh charge of gas and air in proportion to 1 to 7, under compression ratios of 3.45 and 3.4, it is found that the rise in temperature by explosion will approximate 2,018 degrees and 2,004 degrees respectively. The temperatures in this, and in all other calculations in this article is taken from absolute zero, about 461 degrees below zero of the Fahrenheit scale. The temperature of compression, taken from the same tables, is assumed to be 580 degrees at the time compression begins, and for compression ratios of 3.45 and 3.4 the temperature of compression will be 895 and 890 degrees respectively. The comparatively low temperatures taken for the explosions are to make the necessary allowance for the fresh charge being mixed with the clearance space full of burned gases, which lowers the pressure—also the temperature—of explosion from 17 to 25 per cent. and is a fine argument in favor of the scavenging engine.

The temperatures of compression and explosion are necessary in order to find the pressure due to the explosion, which is calculated, as stated by the formula $P=\frac{p_3\,T}{t_3}=\frac{580\times 2{,}018-895}{895}=189$ pounds for the four-stroke cycle engine, and $P=\frac{580\times 2{,}004-890}{890}=188.5$ pounds for the two-stroke cycle, twin cylinder engine.

Ratio of expansion: r_5. In most gas engines the exhaust opens about ⅞ of the expansion of power stroke, hence the expansion volume equals ⅞ V, as noted in the list of characteristics. This makes the ratio of expansion a little different from the ratio of compression. It is found as follows: The cylinder volumes C, are 127.23 and 79.5. Taking ⅞ of these, and adding the clearances 52.3 and 32.59, we obtain $\frac{127.23\times 7}{8}+52.2=168.52$, and $\frac{79.5\times 7}{8}+32.59=102.9$ respectively. Then, the ratios of expansion are: $r_5=\frac{163.52}{52.2}=3.14$, and $\frac{102.9}{32.59}=3.146$.

Pressure of exhaust: p_5. A good deal of heat is lost through the early opening of the exhaust valve which, as stated, usually opens at about ⅞ of the piston travel in the expansion or power stroke. Using the "Table of Usual Exhaust Pressures," published in "Power" several years since, it can be approximated that the exhaust pressure for a ratio of expansion of 3.14, from an explosion pressure of 189 pounds, is about 28 pounds, and for the 4-stroke cycle engine with a ratio of 3.146 and a firing pressure of 189.5 pounds, there will be an exhaust pressure of about 28.5 pounds. Thus, p=28 and 28.5 pounds respectively—absolute pressure of course.

Number of explosions: E. These are taken from the given data and are 225 and 450.

Having found all the "characteristics," it is in order to gather them up as follows:

Name.	Symbol.	Engine. 4-Stroke.	Engine. 2-Stroke.
Cylinder diameter	C	6."	4.5"
Cylinder area	A	28.27"	15.9"
Piston stroke	L	4.5"	5.0"
Piston stroke	L	.375'	.417'
Cylinder volume	C	127.23"	79.5"
Cylinder clearance	V_3	52.2	32.59
Cylinder volume plus clearance	V	179.43	111.93
Pressure before compression	p	13.2	14.
Pressure after compression	p_3	69.8	73.
Ratio of compression	$\frac{V}{V}=r_3$	3.45	3.4
Pressure of explosion	P	189.	188.5
Pressure of exhaust	p_5	28.	28.5
Ratio of expansion	r_5	3.14	3.146
Number of explosions	E	225.	450.
Expansion volume	⅞V	166.32	102.9

Having found an expression for all the quantities named, the formula mentioned at the beginning of this article may be brought forward as follows, and the letters replaced by their respective numbers as follows:

$$HP=\frac{EV_3}{1000}\times\left[\frac{P-p_5\,r_5}{120}-\frac{p_3-p\,r_3}{140}\right]$$

$$=\frac{225\times52.2}{1000}\times\left[\frac{189-28\times3.14}{120}-\frac{69.8-13.2\times3.45}{140}\right]=7.85.$$

As this is for one cylinder only, the work which could be done by both cylinders is $2\times7.85=15.7$ horse power.

From the expression of $HP=7.85$ may be calculated the mean effective pressure, which was assumed at the beginning of this article to be in the neighborhood of 70 pounds. Substituting values in formula

$$HP=\frac{PLAN}{33.000}=7.85=\frac{P\times.375\times28.27\times225}{33,000}$$

it is found that $P=108.5$ pounds, nearly, demonstrating the fact that it is better to spread the assumption among a large number of items and let them balance the errors in each other, instead of having a considerable possible error in one assumed quantity which may affect the result 25 to 30 per cent.

The power of the two-stroke cycle cylinder is yet to be found, but by bringing down the requisite quantities into the formula used for the engine already figured, it will be found that HP=

$$\frac{450\times32.59}{1000}\times\left[\frac{188.5-28.5\times3.146}{120}-\frac{73-14\times3.4}{140}\right]=9.4.$$

For the two cylinders it would be $2\times9.4=18.8$ horse power. The mean effective pressure of this engine figures from the PLAN formula to be about 104 pounds. Thus the engines should deliver 15.7 and 18.8 horse power respectively, the latter being the two-stroke cycle machine. Both these engines would give better results were the length of the cylinders increased and the clearance space enlarged.

The four-stroke engine should run at a considerably higher speed. It could probably develop 20 horse power at a speed of 600 revolutions a minute, but not with a 24-inch screw attached to it unless geared back considerably. The two-stroke cycle engine would probably run faster if not loaded quite so heavily, as the 24-inch screw propeller is a pretty big load for an engine of that size. With a 22-inch or a 20-inch screw, or a 24-inch screw of finer pitch, more revolutions could be obtained, more power developed, and probably greater speed given to the boat.

Owing to a total lack of data, it will not be attempted to calculate size of boat which could be handled by the engine in question with the screw used, and that appliance is bare of all data which could decide its characteristics. For instance: In speaking of a screw propeller there should be given the diameter, the pitch of the blades, the length of hub and its diameter, the number of blades, and, if possible, their width and area. That being done, there is an opportunity for determining the power required by the screw at the stated speed, or at any other speed.

For properly figuring propeller requirements there should be given the following data concerning the boat which is to be driven by the propeller:

S=Speed of boat in knots an hour.
F=Speed in feet per minute.
V=Velocity of boat in miles an hour.
L=The length of the boat.
A=Area of amidship section in square feet.
D=Displacement of boat in tons.
C=Co-efficient determined by lines of hull.
W=Wetted area of bottom of boat.
P=Pitch of propeller in feet.
N=Revolutions per minute of propeller.
d=Diameter of propeller in feet.
R=Resistance of boat in pounds.

Co-efficient C varies from 200 to 500, according as the lines of the hull are full or fine. The horse power is found by multiplying the cube of the velocity by the cross sectional area of the midship section and dividing the product by the indicated horse power of the engine. If desired, the cube root of the square of the displacement of the boat may be used instead of the sectional area.

Haswell gives a scheme of power distribution for screw propellers as follows:

	Per Cent.
Friction of engine and shaft	10
Friction of load (thrust)	8
Friction (skin) of propeller	6
Slip of propeller	26
Useful work driving boat	50
Total	100

It should be kept in mind, in figuring boats and propellers (and boat engines as well) that the slip is the greatest power absorber except the direct propulsion of the boat, and that the slip increases with the resistance of the boat. It increases slightly with the revolutions of the propeller, and increases greatly with the pitch of that appliance, but the resistance decreases with the length of the screw and it decreases greatly with an increase in the area of blades on the same diameter of wheel.

Martin, in his calculations, assumes the losses from and in engine to screw to be 25 per cent. and the losses from engine to and including thrust and slip to be 60 per cent., leaving only 40 per cent. for useful propulsion of the boat.

If the gentleman will kindly supply the data called for by the table of co-efficients given above, the writer will gladly compute the size of boat and propeller which will work well with either of the engines described in the foregoing. The two-stroke cycle engine is more desirable for boat driving because of the more evenly distributed power impulses. The pitch of the propeller has much to do with the speed of an engine in a boat and it may be that the changing of the 24-inch propeller to one of the same diameter and finer pitch will be an improvement. But this, as well as many other points, cannot be determined without the full data as noted by the several letters above tabulated.

BENT CRANK SHAFTS.

How to Locate and Detect the Trouble and How to Remedy It.

A badly bent or twisted crankshaft will, of course, render an engine useless, and leave no doubt as to what is the matter, but a shaft not infrequently gets slightly distorted from one cause or another without being sufficiently bad to disable the engine. Such a shaft may be so slightly out that it may appear to the eye to be quite true, and the fault can only be detected and located by testing the part with the surface gauge either on the surface table or in the lathe. Generally a fault of this sort proclaims its presence by heating in one or more of the bearings, so when a bearing has been taken down on that account the shaft should always be tested at the same time. Sometimes an examination will show that a shaft is bent, the indication being a very hard bearing mark all round the brass at one end. At that end also it will be found that the brass, if tried with the callipers, will be considerably larger in diameter than the shaft.

Such distortion may cause a sudden seizing of the bearings, or, in more aggravated cases, a sudden stoppage of the engine, such as would happen when a big end

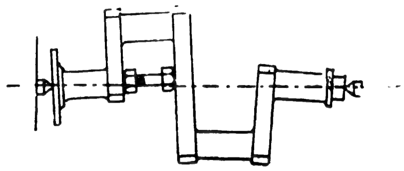


FIG. 1.

bolt breaks and jams the connecting rod in the crank case. Therefore, should there appear to be a loss of power, accompanied by heating, the shaft should be tested, and, should the breaking of a big end bolt or any other cause have suddenly stopped the engine, the crankshaft should be taken down forthwith and tested.

Another point which should be noted is that a crankshaft of a ductile brand of steel may twist in the length of the journal next to the fly-wheel without throwing any of its other parts out of true. When this occurs the engine will continue to run as well as ever, but the fly-wheel will have been rotated relatively to the cranks, so that, when it is necessary to re-time the valves, or the ignition, the timing marks on the rim of the fly-wheel will be all out. The writer has seen cranks in which these marks have been twisted 90 degrees out of their

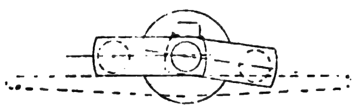


FIG. 2—THE DOTTED LINES SHOW THE LEVER, FIG. 3, IN POSITION.

proper position, while the crank otherwise remained practically true. These cranks, however, were in some of the earliest engines, in which steel of a particularly ductile quality was used.

To true up a crankshaft is far from an easy job, and many engineers consider it the soundest policy to scrap the shaft and fit a new one. In endeavoring to true a bent crankshaft it might happen that the end would be achieved almost at once, but the chances are all against it, and days might very well be occupied over the job, and even then failure be the result. In any case, only a really good man should tackle the job.

To begin with, after locating the error, the shaft should be heated at the point where such error occurs, but not sufficiently to hurt the bright surface. Then, if it is a simple bend, as shown in Fig. 1, the crank webs remaining in the same plane with each other, the shaft should be mounted between the lathe centers—packing having first been placed between the webs of the cranks which remain true—and the center of the lathe moved in by the hand wheel, thereby pressing in the bent webs until the correct position is restored. The most suitable packing

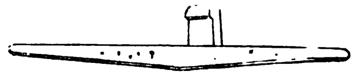


FIG. 3.

is a stout bolt of suitable length, as shown in Fig. 1. The bolt should slip easily between the webs when the nut is screwed right on. Then the nut is unscrewed until the bolt is jammed in position, but it must not be forced too much or the webs may be spread. From this it will be seen that a stout bolt may be employed in this manner to spread the webs of a crank which has been bent inwards instead of outwards, as shown. A bend of that sort is not so likely to happen, however, as the impulses, occurring as they do, on the top of the crank throw, tend to bend it in the manner shown in Fig. 1.

A simple bend is comparatively an easy matter to correct in the manner just described, but, where the shaft has been twisted, so that the crank pins are out of their correct relative position, as in Fig. 2, the job is not so easy. Here the shaft must be heated, as before, at the point where the twist has occurred, and the true web next to that point gripped in the vice, or bolted down on a machine table, so that the web which is out of truth just overhangs the edge. A double-ended lever, Fig. 3, can then be placed over the latter, and, by carefully applying equal pressure at both ends, the twist may be corrected, but there is always a chance of a further bend being

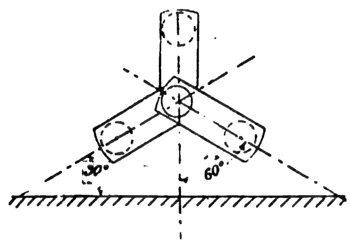


FIG. 4.

caused in the operation, so the shaft must then be tested for that, and trued up, as before described.

When a crank is both twisted and bent, first remove the twist as above and then the bend. Carefully callipering between the webs will assist in showing whether the bend has been removed, as the faces of the opposing webs should be parallel throughout their length. In testing for twist in a crank, place it in V blocks on the surface table with the webs horizontally, and try the crank pins and main journals with the hook point of the surface gauge. In cranks for 2 or 4-cylinder engines, this will show at once the extent and position of the fault, but in 3 and 6-cylinder crankshafts a protractor is necessary. In every case of twist the main bearings should be brought true before attempting to correct the relative angles of the crank pins.

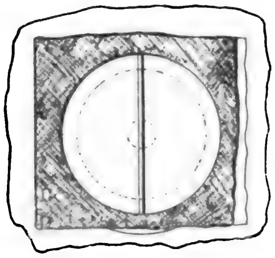
To test a 3-throw crankshaft, place it in the V blocks, as before, and set one of the crank pins level with the main bearings. Now mark with the surface gauge the centre line along the outside of the web. Then measure the length of the crank along the web and mark a line at right angles to the first by means of a square from the table, and put a small centre dab where they cross. Then

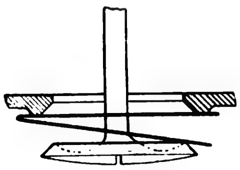
turn the crank and repeat the operation with the other two pins. Next set the centre line of one of the cranks in the vertical plane with the other two cranks pointing downwards. The protractor can then be applied to the centre lines of the other two webs, and it will at once be seen if their relative angles are correct. Fig. 4 shows this clearly, and, as crank angles of a 3-throw shaft are 120 degrees, it will be seen that the angle on the protractor should be 30 degrees. That is to say, with one throw vertical, the other two will, if correct, be at angles of 60 degrees with the vertical or 30 degrees with the horizontal.

For a 6-cylinder shaft, the procedure is the same.

One Way to Grind Valves.

To grind in a valve which has been very much burnt, cut a piece of emery paper to dimensions a little wider than the valve seating and twice as long, then double it over so that both surfaces are cutting surfaces. Holes are then made in the emery cloth and the valve stem passed through, so that the emery cloth is threaded up





immediately beneath the valve stem as shown. The valve is now placed in position and twisted for grinding under comparatively high pressure. Both emery cloths will conform to the valve head and seating, and if the valve turns and the emery cloth remains stationary the valve will be ground on the upper emery, while if the emery rotates the valve seating will be touched up with the lower emery.

Washing the Car.

Everyone knows that after a muddy drive the car should be washed immediately it comes in. However, there are times when circumstances make it almost impossible. If the varnish is well set it may not matter, but when the drive in the wet has been a very long one and the back panel of the car is thoroughly plastered with mud, it should not be left unwashed. As a matter of fact, there was no great harm in leaving it for a few hours before the days of road tarring, but now one runs the very greatest risk of spoiling the paint upon the back panel, wings, and one or two other places. We are not referring to roads which have been freshly tarred. Everyone knows that they do harm to the paint work, but stretches which have been tarred weeks previously "pick up" on a very wet day, and here and there a black spot of tar is deposited with the mud on the back panel. It does no harm if it is washed off while the mud is liquid, but if the whole coating is left to cake the tar will adhere to the paint in such a way that it is impossible to remove it without scratching, and the panel which was hitherto almost like a mirror will show little black spots, which can only be removed by a coach painting expert, and even he will not be able to do it without some little scratching. Not only so, but some of the road preparations have a corrosive effect, and, even if the back of the car is not spotted, the liquid mud may eat into the varnish if it be left on for a few hours and give it a sort of mottled appearance, robbing it of all its lustre. Therefore we repeat whenever the car is very dirty wash the parts which are likely to be disfigured in the way we have mentioned immediately it comes in.

REPAIR WORK AND TOOLS FOR BEGINNERS.

A Few Simple Points That May Be of Use to the Beginner in Repair Work.

The steering gears of cars often get loose through wear of the pins and eyes. As there are no means of adjusting these joints, new pins must be turned up and put in. The pins when taken out will be seen to be worn and the eyes oval as in Fig. 1.

If the reader has a stock of reamers, the best way is to ream the holes out. They can be filed out if the holes are shallow, but if there is a deep boss it is almost impossible to get a cylindrical hole. The best way would be to drill them out 1-32 inch larger or 1-16 inch, if much worn, and turn the pins to this size. The pins should be case-hardened.

Great care must be taken in drilling the holes that the drill follows the old hole exactly, so that, if possible, the rods and jaws should be drilled together in place. Fig. 2 shows the drill having gone wrong. By far the best way would be to buy a reamer of the size required and make a really good job. Shake or play in the steering gear does not come on suddenly; there would be in most cases plenty of time to procure a reamer from the tool dealer. The reader must not forget when putting in new pins to insert the top pin in the head or to drill the hole for the split pin for securing the nut. If car builders would take the trouble to bush the steering rods considerable time would be saved in repairs.

In some cases the sparking and connections to the carburetter are operated by thin rods bent at right angles at their ends. This, to an engineer, seems a slovenly way of doing things, but the system works well. These light rods after a time wear at the joints, and it becomes necessary to replace them. The best way is to put in slightly

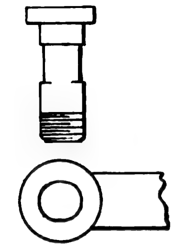


FIG. 1—WORN STEERING PIN AND ROD.

larger rods, drilling the holes in the levers or bell cranks if necessary. To bend the rods, drill a hole in a piece of flat iron, fix this in a vise, heat the end of the rod—having previously marked the place where the bend is to be—insert the hot iron in the hole, and bend down, using the hammer to insure a right angle turn, not a curve. The hole must be bigger than the rod or the hot end will not enter, Fig. 3. The end must be filed circular, for it will be noticed that one diameter is greater than the other. If the rod is too long it may be bent, that is, if the force it has to transmit is small. If too short, it must be drawn out.

In many old cars the 2 to 1 gear, which operates the exhaust, has a fiber wheel. Fiber wheels are liable to wear, and a tooth break out—this sometimes happens with metal wheels. The writer has repaired the fiber wheel by inserting a screwed pin in the place of the broken tooth; it is a simple job that any fairly skilled

blacksmith could do if the breakdown happened on the road.

The tooth that is most likely to go is the one that is being driven at the moment the exhaust valve begins to lift. The writer, once finding that particular tooth had begun to wear, shifted the fiber ring round its boss, securing it in another position, so that unworn teeth lifted the valve. The wipe contact for the electric connections, being attached to this wheel, had, of course, also to be shifted. Even in metal wheels teeth can be inserted by putting in a screwed peg or stud, Fig. 4. The top of the peg should be flattened out to give more bearing surface. It is impossible to do this after the tooth is screwed in, so it should be done before. The stud should be made from a piece of wire or rod bent to an L shape and flattened out at the front to form the top of the tooth. When this is screwed in by means of the bent end, it is sawn across at the dotted lines. If sufficient thread cannot be got in the hole, the peg may be brazed in. The peg must be filed to correspond with the other teeth. Of course, this is only a makeshift; a new wheel should be procured, but this method will often enable a car to run a few hundred miles till the new wheel is put in.

A clamp for a broken spring is a very useful thing to carry (see Fig. 5). It consists of two U shaped iron rods screwed at both ends. The screwing must be done

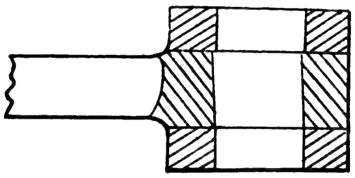


FIG. 2—DRILL GONE WRONG.

before the rods are bent. The corner where the bends come should be marked with a deep center-punch mark, or they may be marked with a file so that the marks can be seen when the iron is hot. Two pieces of hardwood packing should be placed above and below the spring, and two plates of iron across the springs for the nuts to tighten on. The hardwood packing should have grooves cut in it where the rods come to prevent them working out or the U irons shifting if the nuts got loose. Iron bolts and plates can be used in place of the U irons, but it is not so neat a job.

If a stud breaks off close to the hole in which it is inserted—and studs seldom break at any other place—the first thing is to get the broken part out. Put some paraffin oil round the stud to soak into the threads.

If a piece stands up above the casting the stud can sometimes be moved by using a hammer and chisel—not a sharp chisel, as this would at once cut off the projecting part. A diamond pointed chisel is the best to use, as its nose gets a better grip into the metal than a flat or cross-cut chisel would. If the stud will not move, it must be drilled out. In many cases it has to be drilled out in place, and cannot be taken to a drilling machine, and even the swing brace will not turn. A small hole must be drilled down the stud with a hand brace, then a larger one, and a square or triangular piece of steel driven in and turned with the grips. If this fails to move it, it must be drilled out, using a drill that is well under the size of the thread, so that the thread in the casting should not be injured. The hole should be cleaned out with a tap; but before doing this the reader must see that his taps are the same as the threads in the casting. If the stud is of metric thread, this must be used; or if metric dies are not to be procured, the new stud must be cut up in the lathe. Another way would be to tap out the hole to the next larger size and put in a similar thread, but before doing so it should be ascertained that the larger nut will be able to be turned; if not, the nut must be reduced by filing, for most nuts are really stouter than they need be. At the worst a nut could be filed round and tightened with the grips.

If a car engine knocks it may arise from several causes. A loose flywheel is about the worst cause. It is difficult to find if a flywheel is loose, and in some cases it is a serious and tedious job to dismount the engine. If the

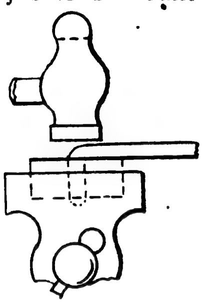


FIG. 3—BENDING ROD.

flywheel is suspected of being loose, the best way to ascertain this is to jam the engine, so that it will not move in either direction. This can be done by jamming the starting handle, so that the engine cannot turn backwards, and with a strong pair of gas tongs holding it tight in the other direction, while an assistant grasps the flywheel with both hands to see if it is loose. Or the end of the crankshaft can be bolted with two bolts and a plate to a stout piece of flat iron. The flywheel should be tapped with a hammer if it seems tight to the hands. If it is loose a new key must be fitted. This requires very considerable care and should not be attempted by an amateur unless he has much mechanical skill.

If the knock is not in the flywheel, and does not proceed from overheating or premature sparking, it may be in the gudgeon pin. If the bush is worn a new one must be turned up, and possibly a new pin fitted.

If the knock is in the big end of the connecting rod the brasses must be filed away till the shake is removed. Some crank pins in engines that have done a good deal of work will be found to be oval, owing to the pressure of the explosion being received on one side of the crank only. The crank should be carefully callipered all round

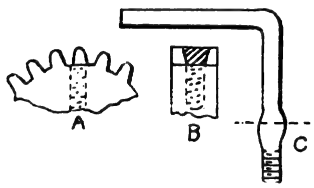


FIG. 4—REPAIRING A BROKEN TOOTH.

to see if there is any part that has a less diameter, for if the big end were tightened on the small diameter it would bind hard when the crank had turned through a quarter of a revolution. The breakage of the connecting rod of a traction engine has more than once resulted from such cause, but it is not so likely to occur in a motor car engine, as the effort to turn the engine by hand would at once show that something was wrong. The engine, however, might run stiffly for some time.

If the main bearings are loose, the edges of the brasses must be filled up and possibly a slice taken off the aluminum crank case. If new brasses are put in they will, of course, be thicker than old ones, and if the aluminum crank case has been previously filed down a strip of asbestos millboard must be inserted to keep the joint tight, otherwise the oil would escape on the road.

Some repairers insist on taking down the engine to do any work inside the crank case. In very few cars is this necessary. The writer has taken off the bottom of the crank case by lashing the forward end of the crankshaft to some part of the car, thus holding it up, and by packing up the flywheel by blocks of wood and wedges. Then the bottom of the crank case can be taken off and inspection made. If this is done over a pit—which is

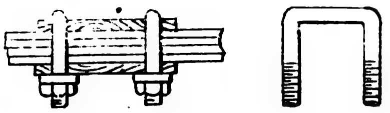


FIG. 5—SPRING CLAMP.

best—a stout and fairly wide piece of planking should be laid across to support the blocks and wedges which hold up the flywheel; if these slipped out great damage might be done.

Notwithstanding that the car is carefully housed in winter or some of the compounds advised to prevent freezing are used, a cylinder cracked by the frost is not unknown. If the crack is in the jacket of the cylinder, and not in the head or around the water space of the valves it can be patched.

Fig. 6 represents a cylinder cracked by frost. The dark line shows the crack. As cracks have a habit of extending, a small hole should be drilled at each end of the crack or a little beyond it, for the crack may go further than is visible to the eye. A ¼-inch tapping hole should be drilled and tapped, and a screw inserted and screwed home, and the end filed off flush with the metal.

Then a piece of stout sheet copper, not less than 1-12 inch thick, should be cut out covering the crack and allowing ⅝ inch or ¾ inch if it be a long crack, all around the crack. This must be bent to fit the cylinder, and fixed down with a number of 3-16-inch or ¼-inch screws, putting a piece of canvas smeared with red lead, putty,

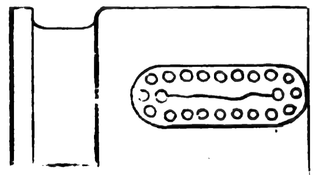


FIG. 6—REPAIRING A CRACKED CYLINDER.

or thick oil paint under the copper. The patch may leak a little at first, but will probably "take up" in a few days.

A plan which would probably answer if the cylinder had no excrescences on it, would be to use thinner copper or sheet iron, and bind it on with steel wire from end to end of the patch plate.

Cracks are said to have been stopped by pouring into the jacket or water space a strong solution of salammoniac. This causes rust to form and fill up the crack. That rust has a wonderful power of fastening iron together every one must have noticed who has had to unscrew a nut that has been long exposed to the weather. The holes drilled and plugged at ends of crack must not be omitted.

(To be continued.)

Within three years the city of New York has spent $750,000 for automobiles for its officials and departments, and has on its pay rolls at least fifty chauffeurs.

Don't run your car to the limit of its power. Any car, one, two, four or six-cylinders, will run better and longer if the power is not taxed to the utmost.

FEED TROUBLE.

What Ensued to the Car During a Spell of Cold Weather.

During two nights of a recent cold spell a pressure feed car had to be kept in an unwarmed coach house. Of course the water was emptied out, and therefore on going to start the car no trouble was anticipated. Pressure was worked up by the hand pump as usual, and the gauge showed that there was no leakage. For all that not a drop of gasoline could be forced into the float chamber, although the tank was full. The air pump was used to the utmost, but, despite the high pressure generated, no gasoline came along the gasoline pipe, and on opening the gasoline tank we found that it was absolutely without any pressure. Even now we do not know the cause of this, but we can safely assume that moisture in the pressure pipe to the gasoline tank had collected and frozen so as to stop it, pressure being maintained in the usual way by the exhaust (and there is always a certain amount of water in the exhaust gases). We should say here that the pressure valve itself was all right. As we were single-handed we could not lift the body to disconnect the pressure and gasoline pipes, and we had to give the matter up temporarily as a bad job. A stove was introduced, and in a few hours the air in the coach house was warm. We then had no difficulty in pumping pressure into the gasoline tank. We mention this matter rather as a problem to be solved than as information in the usual acceptance of the term, but it does contain a couple of hints of a sort after all. The first is that if anyone should experience a similar difficulty to that which we suffered, the only remedy appears to be to warm up the house in which the motor is stored as soon as possible, as the trouble will then rectify itself. The second is that it would be advisable to fit a tap and screw nipple to the plug of the gasoline tank, so that if the pressure pipe should become blocked through condensation of moisture within it or from any other cause it would be possible to pump pressure into the tank direct. There would be some objections to having a tap in the filling-in plug of the gasoline tank, as it might be turned on by mischievously inclined people, so that the best way would be to have a little screw plug in the centre of the large plug and carry the tap among the spares, so that it could be screwed into the filler cap should the necessity arise. There appears to be no reason why it should not arise at any time a pressure fed car is left exposed to extreme cold, as even the provision of a good filter will not necessarily prevent some moisture from passing down the pressure pipe into the gasoline tank, though one is always provided on properly installed pressure systems.

Cleansing the Lubricating System.

Some motorists never think of cleaning out their lubrication system. If they have a mechanical oil pump and filter they too often leave the filter severely alone till it is so hopelessly clogged that it will not pass oil. This neglect very soon brings its own remedy. At the present time many more engines are fitted with gravity or exhaust pressure lubrication than with any form of mechanical pump oiling, and it is particularly with these systems that neglect is so prevalent. We will first take the ordinary exhaust pressure system. On the dashboard there is a tank, usually with sight feed drips and pipes running away to the engine. The oil is forced from the tank into the drips by means of pressure from the exhaust. When the system is properly carried out there is some sort of filter in the exhaust pressure pipe, but even then a certain amount of

fine particles of soot pass into the lubricator, and after two or three thousand miles the lubricator is more or less muddy at the bottom, and some of the mud necessarily goes through to the engine. In extreme cases it results in the blocking of the pipes from the lubricator to the engine, but when it does not come to this it means that the engine is more or less being lubricated with muddy oil instead of clean oil, so that it is advisable to thoroughly cleanse the lubricator, say, every other time the crank chamber is emptied out. Of course, there is nothing better for this than kerosene, and it is much the best while doing the job to cleanse the lubricating pipes by unscrewing them from the lubricator and pouring kerosene or gasoline down them, than by making futile attempts to blow through them, but unless they are very seriously blocked quite the best way is to run paraffin through the lubricator. We may be asked how this can be done, as it is not altogether advisable to run the engine long enough on kerosene alone to get up sufficient pressure to force the kerosene through the drip feeds. What we have done is to fit a bicycle tire valve on the filling stopper of the lubricator. One can then, after filling the lubricator with paraffin, put pressure into it by a cycle tire pump and keep the drips going till all the pipes have been thoroughly cleansed. Of course, on cars where the pressure system is adopted by having the oil tank below the frame a hand pump is usually supplied, so that it is only necessary to empty the tank, fill it up with kerosene and pump up in the usual way. There should always be a plug in the bottom of the lubricating tank, so that its contents can be run off; otherwise the only way to clean it is to take it off, empty it, put paraffin in, shake it about well, and then empty it out of the filling hole—a long, tiresome, and dirty job which is rendered necessary solely by the neglect of some makers to put in a drain plug in the oil tank.

MAGNETO SETTING.

Points That May Save Time and Trouble if Carefully Followed.

A magneto which has practically no advance and retard movement requires to be set with great exactitude, so as to secure the best average results at various engine speeds. It is often, indeed generally, difficult to get a good view of the make and break when the magneto is in its position, and so ascertain the exact moment of the break; but if the wire which earths its primary via the switch and puts it out of operation be detached, and an accumulator with a voltmeter interposed be attached to its terminal, a sharp jerk of the voltmeter needle will occur at the precise moment of the occurrence of the break of the contacts, the engine, of course, being slowly turned by an assistant. A chalk mark can then be made on the frame showing the position of the starting handle at this point.

It is not a good thing to send a current of any strength through the primary winding lest by its direction it tends to demagnetise the magnets; but the amount which can pass through the voltmeter is so small that it will do no harm for a few minutes, and if it is desired to be on the safe side a single cell of the accumulator will suffice for the purpose. The firing point of the magneto as temporarily set having thus been found, it remains to find the position of the piston. If the method of feeling the piston with a rod or wire through a compression tap or through a sparking plug hole be adopted, it is necessary to bear in mind that at the neighborhood of the highest point the vertical movement of the piston is very slight, the crank being nearly vertical. Thus if the whole stroke be five inches, then, roughly speaking, the rise of the piston during one-sixteenth of a revolution will, when the crank is nearly horizontal, be an inch, but in the same period of time when the crank approaches the vertical and the piston is near the top it will only be an eighth of an inch. Hence in feeling the piston it is difficult to be exact, and a very small difference in its height represents a comparatively large difference in timing.

The easiest way to get over this is to ascertain the highest point reached by the piston, mark it on the wire, then mark off on the rod or wire a length of a quarter of an inch from this, and having by the starting handle got the positions at which the piston is a quarter of an inch down on both rising and falling strokes, and marked these with chalk on the frame, the position of the starting handle half-way between these will give the exact highest point or end of the compression stroke.

From the chalk marks defining the position of the starting handle one can see exactly the relation of the firing point to the position of the piston, and adjust it at will. It is assumed that the magneto has been temporarily set up somewhere in the neighborhood of its proper position. In some cars a mark on the flywheel indicates the top of the compression stroke, but the starting handle is by no means always quite vertical at this point.

Chief Reasons for Loss of Power.

If the motor gradually begins to lose power, says C. F. Reddin, of the Studebaker car, there is a distinct cause for it, and one which can be easily located if gone at in a systematic manner.

Broadly speaking, there are three causes for loss of power in a gasoline motor—poor compression, imperfect carburetion or faulty ignition.

These are the fundamental causes for a motor losing power, but each can be divided into a number of subheadings or subcauses.

Poor Compression.—A fundamental principal in the internal combustion motor is that the greater the weight of gas compressed in the cylinder the greater the resultant explosion. If, therefore, any leak allows this compressed charge to escape the power is diminished in direct proportion to the weight of the gas which escapes.

Be sure that the valves are properly seated. This is not always an easy matter to determine, and unless one is familiar with this class of work the matter of grinding the valves should be left to a competent mechanic. Another place where compression may escape is past the piston ring. In a well built motor this is unlikely. Nothing, however, is better for a motor than the frequent use of kerosene, which can be injected through the pet cocks. This will free the rings and keep the inside of the cylinder in fine condition.

A third cause of poor compression is leaks around such connections or joints as the spark plugs and valve caps. Any leak here can be readily detected by squirting some oil around the joints and turning the motor over by hand.

Imperfect Carburetion.—The function of the carburetor is to mix in fixed and unvarying proportions such weights of gasoline and air that the resultant mixture shall be highly explosive. If the ratio between the two is not held within closely defined limits the mixture becomes too rich or too poor. Carburetion troubles are now becoming less and less, and the modern carburetor has been so successfully worked out that little trouble is experienced with the latest models.

Faulty Ignition.—Undoubtedly ignition is the weakest part of a gasoline motor, yet with the modern magneto, with the attention that has been given to details and with the make-and-break ignition thoroughly refined, even ignition troubles are seldom apparent.

THE AUTOMOBILE SURFACE.

Its Injury Is Often Due to the Carelessness of the User but the Painter Is Blamed.

By M. C. HILLICK.

In a direct and most vital way the motor car painter is interested in anything that has to do with undermining the finish applied after the work gets into service. And very reasonably is he thus interested, because in the great majority of cases when the surface goes wrong, or in the estimation of the owner fails to stand up long enough, the carelessness and incompetency of the party employed to handle and care for the vehicle is lost sight of in an effort to hold the painter responsible for the trouble. Moreover, as a rule, he succeeds in practically forcing the painter to repaint and varnish the surface or suffer all the loss of prestige which his influence can bring about.

Ammonia is probably as vicious an enemy of varnish, if, in fact, not more so, than any other known medium. We say this with clear recognition of the effect which coal and various other gases have upon varnish. Ammonia has always been regarded as a medium connected with the horse stable. But in many instances the former horse and carriage barn has been converted into the garage throughout which the ammonia-saturated walls and ceiling radiate the destructive poison so fatal and destructive to the varnish. Admitted that the walls and ceiling have been whitewashed or even painted with certain water paints, said to be both sanitary and ammonia proof, the fact remains that the pungent alkali eats its way through any and all these protective coatings to permeate the atmosphere and attack any surface of varnish housed upon the premises.

The ammonia-stricken surface is easily identified by the painter by the peculiar gray, lifeless appearance of the varnish in the early stages of the disease, and by the ease with which the powdered film of the varnish may be brushed away in the later stages of the difficulty. Ammonia penetrates and burns up the oil of the varnish, which is the life of the material, and when this destructive process reaches completion the usefulness of the varnish as a beautifying and protective medium terminates, and nothing short of a complete elimination of the perished material will enable the painter to build safely upon the old foundation.

When cases of ammonia-stricken motor cars are returned to the painter as "a horrible example" of his handiwork, it is invariably worth while to investigate the causes leading up to such conditions, and to personally examine the exact status of the garage or housing quarters where, in the main, the real cause exists.

Garages heated with coal burning stoves are ill suited to the needs of motor car surfaces, generally speaking. Coal stoves are comparatively few which do not exhale gases in sufficient quantity to prove a menace, if not a direct injury, to the varnish, at least ultimately.

Especially is this true when the ventilation is imperfect, in which case the energy of the vitiated heat for absorbing oxygen becomes greatly increased, thereby robbing the varnish of an important life-giving element. Hot water or steam heated garages, despite certain inimical conditions incident to either system of heating, are in all respects and to a marked degree in advance of hot air furnished by means of the furnace or coal stove.

Not the least of the enemies to which the motor car surface is exposed are those existing in the dust, dirt and mud secretions. City mud, usually charged with a strong percentage of ammonia, and the mud of lime districts, is powerfully destructive to varnish. The capillary attraction of mud as it dries upon the surface serves to extract the oil from the varnish, thus leaving it in the state previously defined as due to the action of ammonia. Soapy or dirty water, particularly the latter, as encountered upon the highways, are well recognized enemies of varnish, and it is to the interests of the painter to make the motor car owner acquainted with the fact. A surface exposed to the attacks of these mediums should be thoroughly washed with clean, soft water as soon as possible.

The damp garage, although such dampness may convey nothing more than certain mild acids purged upon the surface of varnish, not only clouding its brilliancy but working insidious injury to its physical structure. The light, dry, airy, well ventilated garage is absolutely essential to the life of varnish.

LESSONS FOR DRIVERS.

How Carelessness or Ignorance Cause Many Accidents.

There would be fewer accidents if on looking ahead drivers could only be confident as to what the other driver or pedestrian, or other road or street occupant would do, but this is out of the question. No one knows for a certainty what some one else is going to do in this world. He may think when he sees another automobile coming that the car will be turned to one side to let him pass, and the same hypothesis is reasonable in case of the pedestrian or horse-drawn vehicle. But this is not absolutely certain. Of course, when two horse-drawn vehicles approach each other it can be depended upon that the horses will swerve to one side to avoid a collision, even though the drivers are unconscious of danger. In the case of two automobiles, however, there will be surely a collision if the drivers do not act.

Take a recent head-on collision near this city for illustration. One of the cars was a Panhard limousine, owned by M. Lorram, a wealthy resident of New Rochelle; the other was a Thomas flyer, driven by its owner, Dr. S. Van Schaick. The cars came together on a curve while going at about thirty miles an hour. When Dr. Van Schaick and Mr. Lorram's chauffeur saw that a collision was inevitable they reversed their power and jammed on their emergency brakes almost simultaneously. Their presence of mind saved a bad wreck. The cars came together with a crash, but none of the occupants was thrown out. The radiators were broken, lamps were smashed and the glass wind protectors were broken. Mrs. Van Schaick's face was badly cut by flying glass, her nose was broken and several of her teeth were knocked out. She was taken to the home of a Pelham road resident, where she was attended by a physician. Later she was able to return to New York with her husband on a train. The other occupants of the cars escaped with a bad shaking up. Both cars were towed to a garage for repairs.

It is the unexepected that always happens—as well to the automobile driver as to all others. It is noticeable that of the accidents now reported all over the country, by far the larger share is due to what may be termed new causes. For illustration, at first most accidents were due to brakes failing to act, tires coming off, springs breaking, or running into obstructions. But for the past few months such accidents have been very few.

This month there is a notable falling off in the number of accidents reported, and of these by far the larger share were due to the fact that something or some one suddenly appeared in the road or street unexpectedly and the driver of the car had no time to slow down or turn out. For illustration: In Chicago Andrew Gillespie was run down by an automobile driven by a man named Spiegel. It

appears that Gillespie was crossing the street in front of the auto, when he suddenly slipped. The chauffeur, he said, tried in vain to stop the machine, but the man was run over and killed. And here is another case: In New York City a laborer bobbed up suddenly out of a manhole in the street and the car could not dodge him. The driver tried to turn out of his way, but the machine skidded and the rear wheels hit the man and knocked his head against the curb, fracturing his skull and killing him.

The foregoing are but two cases of accidents that might easily have been avoided had the car drivers either been keeping the lookout ahead that is always essential or had they been driving at a reasonable rate of speed. The automobile is the easiest managed vehicle that exists, but no one should run one with his eyes half closed or turned in any other direction than straight ahead of the car, or at such a reckless speed that the sudden appearance of anything in front of it is sure to occasion disaster.

Never throw a lighted match under a car nor carry any exposed flame near a car. Here is a case in point: In making a pathological examination of his automobile's gasoline "tummy," Dr. Washington Dodge, of San Francisco, lighted a match and instantly found himself the center of a flash of spontaneous and sizzling lightning. When Dr. Dodge got out of the sudden fury his mustache, his eyebrows and his forelock had been singed, but his face was not injured and his eyes escaped damage. There was a hurried call for the fire department and the car was sent to a repair shop to recuperate.

A Float Valve Out of Order.

You may think that with the float valve of the carbureter hopelessly out of commission, so that continuous flooding results, it is about time to seek a tow. But an experienced driver who recently found himself in such a predicament proved ingenious enough to find a very simple way out of the difficulty. This was simply to adjust the gasoline shutoff valve, between the fuel tank and the float chamber, so that it permitted a steady flow of fuel at about the proper rate for average running. Then by keeping the motor under practically constant throttle and driving a good deal with the clutch it was found possible to run some forty or fifty miles with very little trouble. Occasional readjustment was necessary until the right position was struck, and at the foot of long hills it was necessary to increase the flow somewhat and at their summits to choke it down; but on the whole the result was a surprising success, even in point of fuel consumption, which was only slightly greater than normal.

Pressure of Tires.

A vast amount of tire troubles experienced are caused by a lack of sufficient air pressure carried in the tire. It is a hard matter to gauge your pressure without the use of an indicator on your pump. A tire with forty pounds pressure will feel as hard as though the pressure were sixty or even seventy pounds.

For the guidance of the uninformed, let us give you a table of the proper air pressure for the several sizes of tires:

Three-inch tires should carry sixty pounds.

Three - and - a - half - inch tires should carry seventy pounds.

Four-inch tires should carry eighty pounds.

Four-and-a-half-inch tires should carry ninety pounds.

Five-inch tires should carry ninety pounds.

A strict adherence to these figures will save you lots of unnecessary trouble and expense.

If you don't see what you want, ask for it.

TROUBLE DEPARTMENT.

Under this head are questions and when possible, replies to them. Our readers will appreciate the importance to inquirers of furnishing the desired information promptly.

This department is intended to be a "trouble clearing house," and it will be esteemed a favor if our readers will add information to it from their own experience or knowledge.

Valves and Fly Wheels.

From Farris Haddad, Pennsylvania.—I wish to ask through your valuable journal what is the advantage of a mechanical inlet valve over that of an automobile inlet valve on a gasoline motor? Does the mechanical inlet valve remain open or closed any longer? Kindly let me know at what position of the piston in the cylinder does the mechanical inlet valve begin to open and when the same should be closed?

I have a four-cylinder air-cooled motor, 3½-inch stroke by a 3-inch bore, without a fly wheel. Kindly let me know what size and weight fly wheel a motor of the above size should have for automobile use.

Reply.—The advantages of a mechanical inlet valve are as follows: By being mechanically opened there is less back pressure, so to speak, put upon the incoming charge than with an automatic valve. The friction of the surfaces of the passages may reduce the pressure of the incoming charge to 13.2 pounds, and having to lift a check valve—which the automatic virtually is—will reduce the pressure still more. Another advantage is that where the valve opens fully and at a predetermined point, the flow of the incoming charge commences earlier than when the automatic valve cannot raise from its seat until the partial vacuum in the cylinder has overbalanced the weight of the valve. Hence the mechanically operated valve is quicker than the automatic. Again, in case of the valve sticking, the mechanical is forced open on time, while the automatic may be very late in its action. As a usual thing, the valves of a gas engine release the pressure at about ⅞ stroke, and the inlet valve should open as soon after that as the exhaust gases have been expelled, say at ⅞ of the succeeding exhaust stroke. In closing, the valve cannot be allowed to remain open more than ⅞ of the induction stroke also, and the time the piston is moving the remaining ⅛ of the stroke is little enough time to allow the inlet valve to close before compression begins.

Regarding the size and weight of a fly wheel for a 4-cylinder air-cooled motor 3 inches x 3½ inches it is difficult to give an answer, as the speed at which the motor runs is not stated. With the speed given, also the limit of diameter possible, a suitable fly wheel could be designed for this motor. To assume all the data above desired would probably result in the design of a wheel which would not suit the conditions at all. If Mr. Haddad will send the required data, we will gladly compute the dimensions of a wheel suitable for his needs.

The Overheating Orient.

From J. E. Whitmore, Iowa—In reply to Mr. McIntire, South Dakota, having passed through a similar experience with a Model B B Orient, 4 h. p. engine, I wish to say there are several causes for the overheating. I use the regular Orient carbureter which, like all others, must be properly adjusted and it is all right. I adjust it to secure the best speed of motor running idle with the throttle lever a little back of vertical, spark lever slightly advanced, and the mixture lever about central. After starting out on the road, I usually move the mixture lever a little more to air. Much can be learned by experience.

It is best to give the mixture all the air it will take. Be sure the float is adjusted to hold the gasoline at proper level, and keep the screen over the air inlet clean. I once had a serious time because this screen became clogged causing the motor to draw too much gasoline at each stroke. See that the belt operating the cooling fan is in good order and tight so that the fan cannot slip. I use one made of leather hooked together with a wire hook. Do not try to run real slow by throttling down the high gear. Aim to keep a uniform speed of the motor at all times as the Orient motor is designed for high speed and must be run that way to secure satisfactory results. I use Monogram oil or Mobile oil with equal results.

I use the machine to carry two or three persons and sometimes carry baggage besides, and can run all day at an average speed of 12 to 15 miles per hour. At such times the only trouble I have is hill climbing as the motor will sometimes get hot then, but if the road is fair after I get to the top, letting the motor speed for a short time on intermediate gear will usually cool down all right. I have made a speed of 8 miles per hour through quite heavy mud with two passengers without overheating. I consider the Orient a good practical machine. I use the regular pump feed for lubricating the motor, giving one charge for every 12 to 15 miles travel on good roads. If the roads are heavy or you are facing a strong wind it may require lubricating more frequently. If this does not help Mr. McIntire out of his troubles and he will address me through your office I will try to aid him in any way I can.

Trouble from a Little Wire.

From William Holly, Pennsylvania.—For three or four days I had trouble with my spark system. I have a three-cylinder car, and the engine is cooled by the air system. It would lose its spark by the time it reached the third cylinder and I could not understand it as my batteries were in good condition. So I worked at this to find if there were any wire disconnections, but could not find any. Then I took my hood off and looked at my spark plug and valves to see if everything was working right. After I had done this I put my plug and valves in again. I then started up my engine, and, I must say, it never worked better since I had it. I also put the hood on, fastened it and got ready to go off. But when I was ready to go I saw I had the same old trouble again. At last, partly disgusted, I began my final search again. Then I found that a wire, connected with a little copper screen in the hood, which I have to let the heat out, came in contact with the spark plug, and that the brass on the hood had nothing but the spark in it. After I had that disconnected I was able to go on my trip. Such a trifle should only have taken half an hour of easy work, but it took me about one day.

Relief from Splashing.

From H. W. S., Indiana.—In your October issue W. E. Morrison, of Indiana, writes an article in regard to relieving the compression in the crank case. I tried it and found it a good thing, but one thing I cannot overcome is the splashing of the oil out of the pipes. My car is a double-opposed 20 horse power Rambler. I put in the crank case lid seven pipes, 1⅜-inch bore, extending four inches above the plate. Now, when I get on the road, the air forces the oil through the pipes against the seat. What would be your advice to prevent this? They are common gas pipes, with no valves or screens.

Reply.—You can easily prevent the oil from splashing out of the pipes if you will fit caps on them, and in turn drill and tap a small hole, say, a quarter inch, and run small pipes down in the big ones about three inches. You have given yourself far more opening than is necessary to relieve the compression in the crank case, so by capping and putting in the little pipes you will be reducing the amount of opening and also getting rid of the oil splashing. When you stop to think that it takes only a little one-eighth inch pet cock to relieve the compression in the cylinders, you will readily see that it will not take much more for the same purposes in the crank case.

Due to the Oilers.

From J. E. Asay, M. D., Illinois—I use a Jewel Stanhope, two-cycle, one-cylinder, ten horse power car, and I wish to relate a little trouble I had early one Sunday morning about 7 o'clock.

The snow was falling fast and was about eight inches deep. I went a distance of about one and a half miles on the high speed. Arriving, and after spending about twenty minutes at the bedside of my patient, I came out to my car, and after trying three or four times to start I found that there was something wrong. I cleaned the spark plug, primed the engine, tested the batteries, looked over the connections and did everything else I thought of until 11.30 a. m. Finally, after working all the forenoon with my car I made up my mind that the oilers had not worked since I left home that morning, and the night before I had filled up the oil tank with an oil which I had not tried before. I looked and saw the oil stringing down through the glass drop sights. I took out the spark plug and with the oil gun oiled the cylinder thoroughly and cranked continuously for about two minutes till the oil had reached all parts of the cylinder. Then I put in the spark plug and the first turn over, the engine was all right again. I went home, took out the new oil and filled up with the same oil I had used before and have never had trouble before nor after in the cold weather. I know from this experience that when my car is running well not to try to make it run better.

Cement for Cloth and Rubber.

From A. I. Gould, Connecticut.—I have some good auto shoes which I feel are too good to throw away, and yet I don't dare trust them, so I have purchased heavy canvas, expecting to line them inside, but I fail to find cement strong enough to cement the canvas in the shoe properly. Can you give me a formula whereby I can cement them successfully?

Reply.—There are a good many adhesives that might answer your purpose, but we are unable to name the one which is absolutely the best. Suppose you try this formula:

Caoutchouc, 5 parts; chloroform, 3 parts; dissolve and add gum mastic 1 part.

Or here is another one that is recommended:

Caoutchouc in shavings, 10 parts; rosin, 4 parts; gum turpentine, 40 parts. Add enough oil of turpentine to form a proper constituency.

Either one of these will probably answer your purpose, and you can try the one which seems easiest to make.

How to Estimate Power.

From an old subscriber, Wisconsin—Will you please tell me in your next issue how much more horse power has an opposed motor 6 inch bore, 4½ inch stroke, 4 cycle, than a twin cylinder vertical, 4½ inch bore and 5 inch stroke? Is the first named engine suitable for a launch? Please specify the horse power of each engine at 450

revolutions, as this is all I can get from the latter engine now in my launch. How many more revolutions should the 4 cycle opposed engine run and what size propeller should be used to give better results, if any. The size of the propeller at present is 24".

Reply—For a full reply, see article elsewhere in this issue entitled "Horse Power of Gasoline Engines."

Mending a Cracked Water Jacket.

From J. W. M., Connecticut—W. H. Crumly, of Indiana, wants to know how to mend a cracked water jacket for a gasoline engine.

First cut a V shaped crease with a cold chisel along the crack from one end to the other. Then shape a piece of sheet iron plate so that it will cover the entire crack and extend one inch beyond each end. Dent it so that it will fit the outer surface of the cylinder. Now drill a row of small holes large enough to admit screws about an inch apart all around the edge of the plate; then place it directly over the crack and drill corresponding holes in the jacket or cylinder wall, a size smaller than those in the plate, and thread them with a tap. Now put some white lead paste in the V shaped crease over the crack and saturate a strip of asbestos—just a small strand of it—with white lead and place it directly over the crease the entire length and a little beyond the ends of the crack. Cut a sheet of asbestos the size of the plate inside of the holes and place this, first soaked in salt water, over the strip of asbestos, and crease and fasten the plate firmly down onto it with the screws. Before doing this, however, all the paint should be scraped off the cylinder to the full size of the patch. After putting on the patch in this manner it may be dressed smooth with a file and let stand a day or two before using the engine.

Battery Runs Down.

From William Hunt, Minnesota—Why should a No. 6 dry cell battery run out in two weeks? This is the second set now in one month. We use the Kingston coil and spark plugs. The engine is a double cylinder. The wires to battery are insulated and in good shape. We keep the switch off when not in use. We use six cells to a set.

Reply—The fault is probably due to the ignition. See that it is correct and powerful, and if the trouble still exists, investigate the carbureter. At the low speed, with ignition not occurring so rapidly, it is probable that the battery gives sufficient spark to ignite. But when you try to speed it up the increased demand on the battery quickly runs it down, so that ignition does not occur.

Batteries Run Out.

From William Schultz, Nebraska—I have a Model R, Ford Runabout and I am troubled very much with the ignition. I have used the storage battery, which did not last long. I am now using dry batteries, but they give out on two to three drives, and I cannot account for their giving out so quickly. I can't see where it could be short circuit, as the engine works all right when the batteries are new. I have been corresponding with the Dayton Electric Manufacturing Company in regard to their Apple Dynamo Ignition system. Can you inform me if this outfit works satisfactorily and how it lasts?

A Cylinder Knock.

From E. L., Tennessee.—In my motor there is quite a noticeable knock in one of the cylinders. I have drawn up the connecting rod and crank-shaft bearings and found the fly-wheel tight, but still there is this knock. What can I do for it?

Reply—Possibly or probably the trouble is due to too early ignition. Retard the spark and if it does not remedy it write us again with full details.

Friction Gear.

From N. A. Noble, Maine.—Is the friction transmission a success on hilly roads? As I intend to change the transmission in my car this Spring, would like to have some one tell me their experience with the friction hang.

Recharging a Battery.

From F. L. Cooper, Iowa.—If any of your readers have had any experience with recharging by using a closed circuit battery, I would be much pleased to hear from them through the columns of your magazine.

Cleaning a Cylinder of Carbon.

From E. H. Slaick, Indiana.—Do you know of anything that will clean carbon out of a cylinder without taking it off or using coal oil and not hurting the cylinder?

THE IDEAL AUTOMOBILE SWITCH.

The manufacturers claim for this switch an efficiency of 100 per cent. and absolute perfection in every respect.

FIG. 3.

FIG. 2.

FIG. 1.

It is constructed in such a manner that the connections are impossible to reach, because of their position, and it is impossible to start the engine without using the proper blade.

It is not like the common auto switch, in which you can insert a nail or piece of wire and make the required contact.

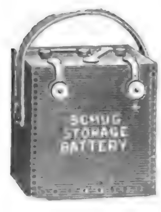
In cuts shown, Fig. 1 is the blade. Inserted in Fig. 2, it gives the effect of Fig. 3, and when the blade is in place and in either of the peculiar spring constructed contact posts (which always gives a positive and clean contact) it cannot jar out of position because it is self-locking.

Another Ideal feature, and a good one, is that it has a contact point marked (OFF) in Fig. 2, which may be used in connection with ground wire of high tension magneto.

For further information, address the Ideal Switch Co., Plainfield, Conn.

SCHUG STORAGE BATTERY.

The Schug Electric Manufacturing Company, of Detroit, Mich., is putting on the market a storage battery which it is now manufacturing in its own plant. The storage battery is built with separate rubber



jars, and thus the danger of breakage is avoided.

Another unique feature in the Schug Battery is the way the case is put together. The bottom of the case is fastened with maple pins, these being in no way affected by the acid. There is no chance of corrosion because there is nothing to corrode. The cells are joined together with lead connectors, burned together, and the terminals are

brought over the side of the box; the only metal parts used that are not made of lead are the screws and washers, used to fasten the extra-heavy best-grade rubber handle or strap to the box, and the extra-heavy brass thumb-screws used for fastening the wires to the battery. The top of the battery is sealed with a special acid-proof compound. The Schug Battery will have a long life and will cost little to keep in order.

INNERSEAL PUNCTURE REMEDY.

A new article appealing to the automobile and bicycle trade is called "Innerseal" Though this is called a "puncture remedy," it might perhaps be styled with greater propriety a puncture preventive. It is not to mend punctures, but to inject into the tube so that when a puncture occurs it will be self-healing. The manufacturers' claims for "Innerseal" are as follows:

They state that it will do what no other tire remedy can do in healing tires; it positively will not loosen the plugs, will not injure the rubber or interfere with vulcanizing and will mend instantly any reasonable sized puncture. "Innerseal" is a silvery, flaky powder. It is perfectly clean and guaranteed not to soil the hands or clothing and it will not ooze through the punctures, besmearing the tire with a nasty, sticky offensive substance, as is the case with some other so-called puncture cures. "Innerseal" is put into the tires before your car leaves the garage; then, when punctures occur, they are self-closing. An Ohio car owner has run 5,000 miles on one set of tires without a particle of puncture damage, over all kinds of roads, and similarly strong testimonials are numerous. If you are a car owner do not fail to try "Innerseal." Probably your dealer keeps it, but write, anyway, for full information to the Innerseal Mfg. Co., 321 Frankfort Ave., Cleveland, O. Dealers not carrying "Innerseal" in stock should "get on the band-wagon." Write for trade discounts, terms, etc. In all correspondence please mention the AUTOMOBILE DEALER AND REPAIRER.

TIRES.—In this issue will be found the announcement of the Broadway Rubber Tire Works, 51 W. 63d Street, New York. They are dealers in both new and second-hand tires; recovering and repairing a specialty. Call or write for price list, mentioning THE AUTOMOBILE DEALER AND REPAIRER.

TRAVER PATENT BLOWOUT PATCH.—In this issue will be found the announcement of the Traver Blowout Patch Co., Browning Building, 1265 Broadway, New York City. This patch fits inside of the shoe. No cement, straps, lacings or bolts. It locks on the rim with the shoe and positively cannot "creep." But see their announcement on another page, and in ordering or writing for particulars mention THE AUTOMOBILE DEALER AND REPAIRER.

RUBBER CEMENT.—F. B. Parks, 173 Prescott St., Grand Rapids, Mich., makes a rubber cement that heat does not affect. It contains no acid. It practically vulcanizes the rubber without heat and can be used in all kinds of repairing, such as auto tubes and casings. It will stick in the hottest of weather. But consult their advertisement and send for a can, mentioning THE AUTOMOBILE DEALER AND REPAIRER.

MAKE YOUR OWN METAL POLISH.—Robertson & Co., 324 W. Madison St., Chicago, are manufacturers of the famous "Red Cross" Metal Polish, which is especially recommended for its economy. One and one-quarter pounds of Red Cross Polish at a cost of seven cents per pound, mixed with seven pints of benzine or gasoline makes a gallon of liquid metal polish which the manufacturers claim to be the best in the world. The total cost is only a few cents and there is no danger from fire, because you don't have to mix more than you need at a time. Red Cross Metal Polish is also a great article for dealers to handle. Metal polish is a necessity around the motor car to keep the brass and nickel work bright. Auto owners or dealers who want to find out how to save money on metal polish should write at once for full information to Robertson & Co., 324 W. Madison St., Chicago, and mention THE AUTOMOBILE DEALER AND REPAIRER.

THE BROWN VALVE GRINDING SET.—This is said to be indispensable for the private motorist. It is for sale generally by the trade, but if our readers cannot find it at their regular supply house, it will be furnished direct by the manufacturers, the Brown Company, 515 E. Water Street, Syracuse, N. Y. But consult their advertisement and in writing for further particulars, mention THE AUTOMOBILE DEALER AND REPAIRER.

D. & C. METAL POLISH.—In this issue will be found the announcement of the Ohio Advertising & Sales Co., 4 Swaney Bldg., Niles, O. They make the D. & C. Metal Polish, which cleans instantly, leaving a fine polish. It is said to contain absolutely nothing injurious to any metal. It cleans brass, nickel, copper, bronze, gun metal, silver, etc. Agents are wanted everywhere, and a sample will be sent for 25 cents. But consult their advertisement on another page, and in ordering, mention THE AUTOMOBILE DEALER AND REPAIRER.

AUXILIARY REVOLVING CHAIR SEATS.—In this issue will be found the announcement of Graves & Congdon Co., Amesbury, Mass., manufacturers of the Auxiliary Revolving Chair Seats. These seats have an enviable reputation, are easily attached in tonneau or motor boat, and are sold in the white or upholstered with any material desired. Write for prices and mention the AUTOMOBILE DEALER AND REPAIRER.

Classified Buyers' Guide.

Index to Advertisers.

(Patent Pending.)

The Brown Valve Grinding Set

Contains all the tools necessary to make valve-seating easy, quick and satisfactory. A compact, light, mechanical valve grinder, lifter and our specially prepared valve grinding compound.

INDISPENSABLE FOR THE PRIVATE MOTORIST.

Carried generally by the trade, but if they can't supply you write us, we will tell you who can. We also make the famous Brown Compressometer.

Send *at once* for BOOKLET giving full particulars.

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STRAIN YOUR GASOLINE

and avoid Carburetor troubles.

A little water or foreign substance in the gasoline will put your Carburetor out of commission. Our STRAINER is guaranteed. **Price, $2.00.**

Write at once for catalogue. Special prices to dealers. Address

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IF YOU PAY ANY MORE THAN

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METAL POLISH YOU ARE BUYING **HOT AIR**

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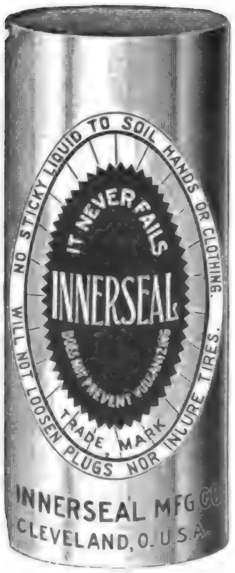
ROBERTSON & COMPANY,
324 W. MADISON STREET, CHICAGO, ILL.

INNERSEAL



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We guarantee INNERSEAL to do exactly as recommended.

If your dealer don't have it, write us and give his name, and we will see that you are supplied.

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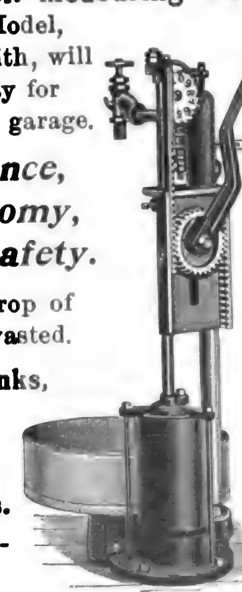
Eastern Self-Measuring Pump

Our 1907 Model, shown herewith, will quickly pay for itself in any garage.



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GOOD GOODS. LOW PRICES.

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$3.50, $5.25, $6.50, $10.00 and up.

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Oily Waste Cans, meeting insurance requirements.
Accurate Measures, and good funnels.
Kamp Kook's Kits that please tourists.

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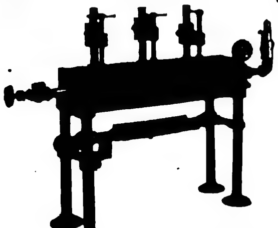

The "Boilerless" Steam Vulcanizer

NEWEST RELATIVE OF THE "EXCELSIOR."

Underneath the square semi-steel body is fitted our special gas burner, thus doing entirely away with boiler for inner tube work.

Furnished complete with steam gauge, safety valve, filling valve, air cock, and our well-known quick-acting clamps. LOW COST. HIGH SATISFACTION. Immediate Shipment.

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Automobile Dealer and Repairer

A PRACTICAL JOURNAL EXCLUSIVELY FOR THESE INTERESTS.

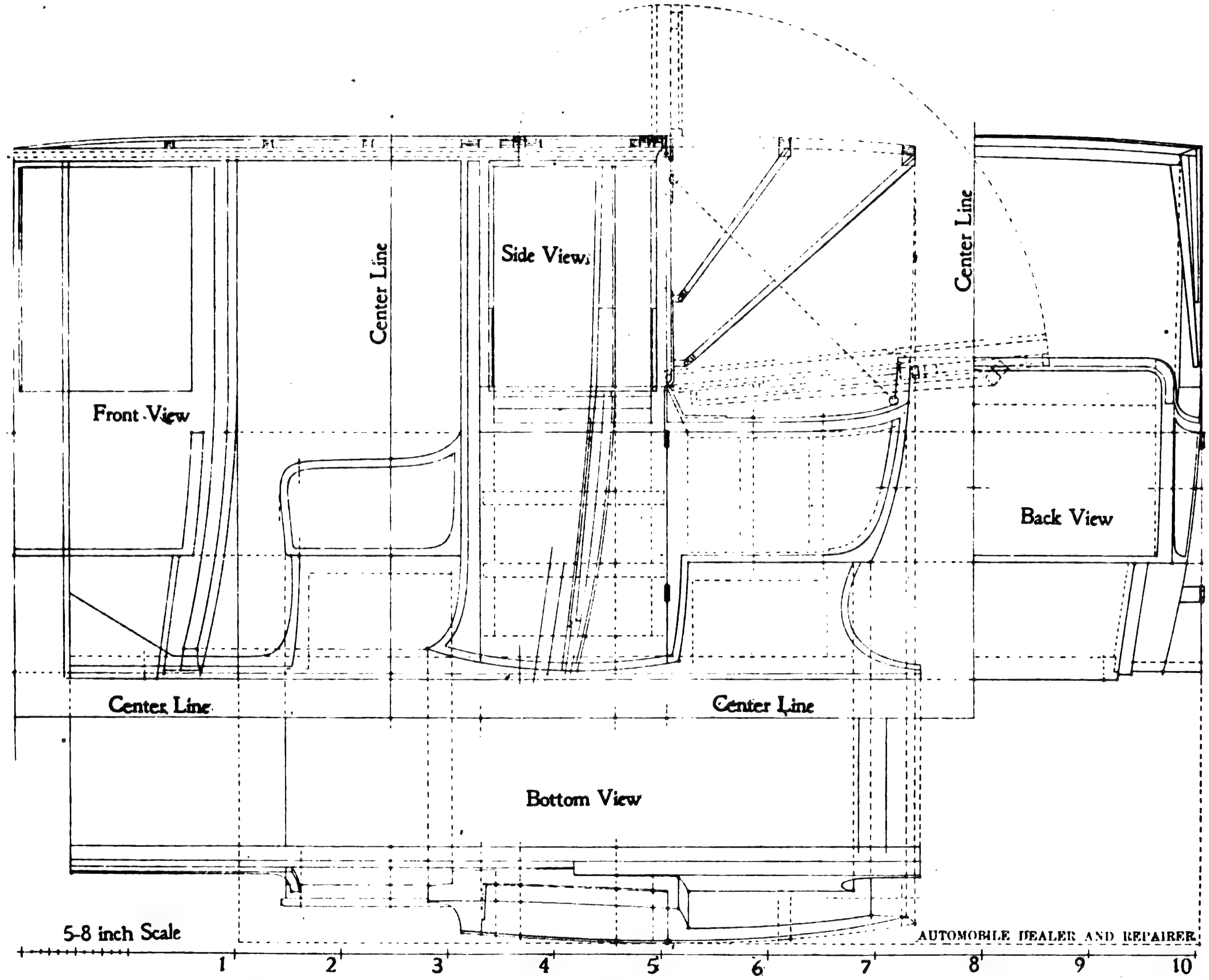
VOL. V., NO. 2. NEW YORK, APRIL, 1908. PRICE { 10c. PER COPY / $1.00 PER YEAR

AUTOMOBILE BODIES.

How They May Be Put on for Taxicabs or for Other Purposes.

In many automobile and carriage shops, taxicab bodies have been made. Some have been trial orders, but in other cases, at least ten or more have been ordered. Some have been built with the extended top in front, while on others the top has been discarded and the front seat raised three inches higher than as seen on this draft. They are built with a paneled upper body and on the landaulet style, as shown on the draft. When built without the extended roof, they can be built so that the upper part can be folded and in such a way that it is an entirely open carriage same as a touring car.

The rear part on the landaulets has two bows which support the top leather. They are both hinged to the upper posts and made so that the upper top curve drops down about one inch on top of the rear bow and forms a nice curve from the front coupe pillar to the rear end. Also the side curves should conform nicely with the lower part of the body at the same time. The width on top of the rear bow should be one inch wider than the body is on the arm rail, or one-half inch wider on each side of the body. The dotted line on the rear view from the arm rail to the top of the bow will give this idea. It is a fact when this dotted line is squared up the cross width on the top of the rear bow looks narrower than on the arm rail below; therefore, it is a necessity to widen this bow on each side, and most of the repairers and body builders know this and do it properly. The small bow, between the rear bow and post, must also conform to the width across so as to conform with the side curve, and this can be seen by consulting the dotted line on the bottom view. This dotted line has a great deal less curve than the belt line curve below, which is necessary when a good looking top is wanted.

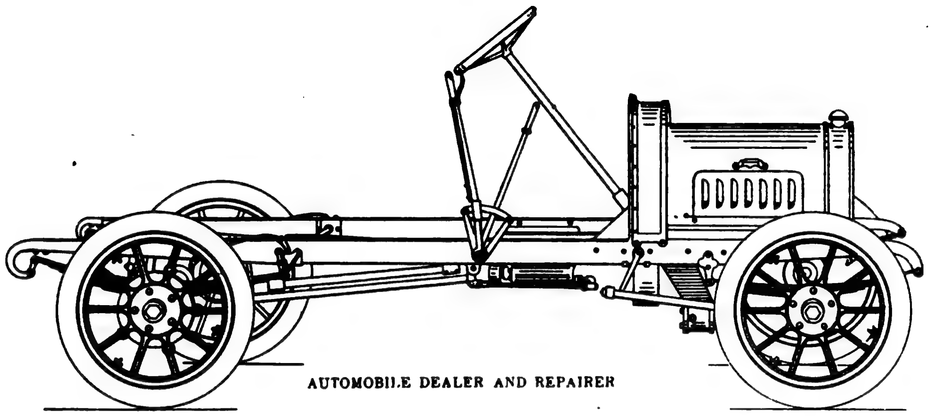


The two bows are fastened to the two posts, and the posts are hinged to the hinge pillars. These hinges can be bought ready-made as can everything belonging to landau fixtures.

On this draft the four bow fastenings are on the hinges, but this is not always the case and the small bow has its separate irons especially made for it to fasten the bows on. The framing of the upper bow corners is done as shown on the side view. Most all rear taxicab side quarters are 26, 27, 28 or more inches long, and if there is a high door, the panels from splitting, no matter how much the doors are forced. Blocking these corners stiffens the doors, and will keep the door pillars from turning and warping. The side quarter panels are put into the grooves with the grain lengthwise with body as shown by the strainers.

The door flappers must be fitted so that they strike against the upper part of the posts when the door is shut; otherwise the glass frames will rattle, making a very unpleasant noise.

The hinge standing pillars and back corner pillars are



AUTOMOBILE DEALER AND REPAIRER

the top will drop directly on the back, when lowered, and if this back is 22 inches or more high from the top of the seat, the top when down will be almost at an angle of 45 degrees. There are two ways to avoid it so the top will lie as flat as shown by the dotted lines. One is to shorten the length of the side quarters and the other is to raise the upper part of the body and lower the depth below. This makes the upper posts longer and consequently throws them further over the back.

To allow the top to drop over the back, do not fasten the curve to the upper door posts, but to the upper door pieces; make the hinge on the upper corners so that the hinge pin will be as shown; make circular joint from the hinge pin. This will throw the upper door piece further up as indicated by the dotted line and therefore backward over the top of the back. If the rear side quarters are longer than on this draft, then shift the curve toward the front in proportion and by doing so the top will again drop over the back.

Taxicab bodies have the same amount of side curve as brougham bodies and trifle more turnunder. The amount of side curve is shown on the bottom view, as is the amount of turn under; also the entire shape and size of the door pillar is shown on the side view. The coupe pillars are dressed square across and on sheet side. Give sufficient bevel so that the doors will not bind when closed or open. Part of the coupe pillars is cut out below the fence rail into which the door pillar is fitted as shown by the door joint and dotted line representing the inner surface of the door pillar. The front door pillar is made 1 7-8 inches thick, lapping over the coupe pillar door joint 1-8 inch to cover the joint when the door is shut. The lower part of the door joint is covered with a metal molding as usual. The rear door pillars are also made in one piece. The door panels on bodies of this kind are glued with the grain up and down. Such panels are liable to check the inside edges of door pillars and especially so when the door binds or is forced in opening or shutting. To avoid this, glue small three-cornered blocks in the corners from the top to the bottom between the bars to the panel and the door pillar. Glue canvas over these blocks the same as the rest of the panels. This will prevent all dressed square, and the rear corner pillars same as indicated on the back view. The front, back of chauffeur's seat, has two glass frames which are raised and lowered between the coupe pillars and drop level with the fence rail, making an almost open body.

The length of the body is divided as follows: From dash of seat, 24 inches; from front edge of seat to coupe pillar, 20 inches; thickness of coupe pillar, 2 inches; width of door, 21 inches; length of rear side quarter, 27½ inches; depths of body, from under surface of sill to under front side quarter, 14 inches, and 13 inches under rear side quarter. Depth of frame: Side quarter, 11 inches; depth of door panel from belt rail molding, 27 inches, and to under surface of bottomside, 27½ inches; from belt rail to top of flappers when down on fence rail, 5 inches; from top of flappers to outer top edge of top rail, 27 inches. Width of body out to out: Across front at dash, 35¼ inches; across bottom of side quarter, 40½ inches; across top, 42½ inches; amount of turnunder each side, 1 inch; across front of coupe pillars, 48½ inches; across hinge pillars, 50½ inches; across back corner pillar, top on bow, 46 inches, on belt rail, 45 inches, and on bottom edge of corner pillars, 45 inches. Width between bottom sides, 29 inches, width outside of bottom sides on under surface, 32¼ inches; width of chassis, 32 inches; width on offset, 33¾ inches; amount of recess, ¾ inch each side; width across top under front side quarter, 37½ inches, amount of turnunder; amount of recess, 1½ inches each side. Width across on rear recess, 35½ inches; amount of recess, 1⅝ inches; width across underside quarter, 39 inches: amount of turnunder each side, 1¾ inches; amount of recess each side under rear side quarter, front of coupe pillar, 4⅛ inches each side.

The Chassis: Width across, 32 inches; seating capacity in and outside of body, 5 to 6; frame, pressed steel, narrowed rear and front, giving a small turning radius; front springs, semi-elliptic; length, 40 inches, 5 plates 1⅞ inches wide; rear springs, 45 inches; 6 plates, 2⅛ inches wide; wheels, artillery pattern, with forged steel hub flanges; tires, 34x3½ front and 34x4 inches rear; wheel tread, 56 inches. Horse power, 15.

COST OF MOTORING.

It Can Be Easily Regulated by the Size of the Pocketbook.

Many persons have never considered the automobile seriously because of the prevalent belief that it is a luxury which can be afforded only by the wealthy, but the contrary is the case. It is with automobiles as with horses or yachts, any one of which can be bought for a small amount or for as great an amount as the purse will stand. In the case of the automobile, a good type of runabout can be bought for $500, or the purchaser can pay as high as $6,000 for a high grade touring car, or $11,000 for the palace on wheels. A $6,000 car will take a man and his family away from the heat, dust and turmoil of the city into the peacefulness and quietude of country roads and fragrant meadows. So will the $500 runabout.

Figure the case of a man of moderate means who can set aside from $500 to $800 for the purchase of a moderate priced car. It has been said that the first cost of an automobile is not the consideration, but rather the expense of maintenance and repairs. If you can afford the first cost, the expense of maintenance and repairs is a minor rather than a major consideration. With proper care the expense of maintenance is small. If the owner is of a mechanical turn of mind he will find it interesting and instructive to go over the engine and keep it in the pink of condition. If troubles are anticipated, they are not liable to be encountered; in other words, if a man tightens a nut before an accident happens he will avoid an accident.

If the owner gives proper attention to his engine he will not find the same trouble as will the man who figures everything is all right so long as the machine will go. The majority of troubles are due to lack of care rather than defective mechanism. It is useless to expect of a light gasoline engine what is not expected in the case of a giant locomotive. At the end of every run the locomotive is put into the round-house, carefully wiped and every vital part given careful inspection. If this same plan is followed with the gasoline engine the hard luck stories and repair bills will be reduced to a minimum.

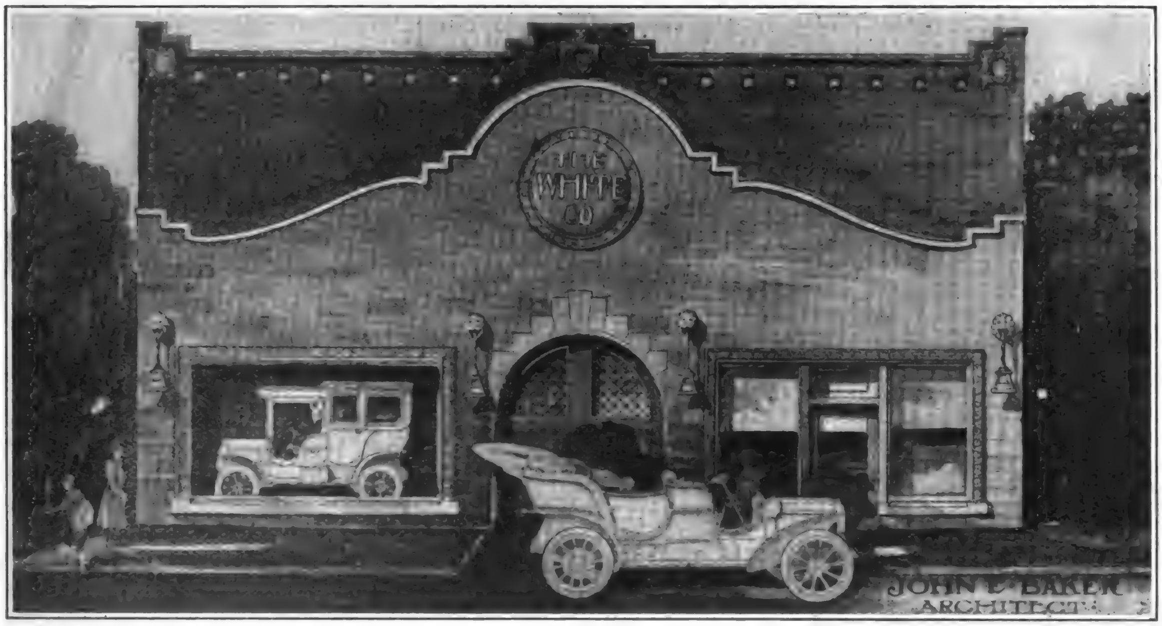
The majority of minor troubles in an automobile arise either in the sparking system or carburettor, which are the heart and lungs of the automobile. If before starting on a trip the driver makes sure that his dry batteries are up to the required amperage and that his spark plug is not sooty, and that his spark is "fat," the chances are one hundred to one that he will make the journey without any trouble, provided there is enough gasoline in the tank. The automobile engine is not a complicated but is a simple proposition, which can easily be mastered by any man or woman of intelligence.

The cost of a car can be regulated by the size of the pocketbook, and maintenance will no more than equal the average amount which a man will spend for pleasure for himself and family, and the pleasure which an automobile constantly affords is realized to a far greater degree than can be obtained through any other source for a corresponding expenditure.

There is the exhilaration of a rapid ride; the evening jaunts; the week-end tours; the vacation trip to distant points, all at a cost less than that of other channels of pleasure. The man who can afford to take his family to the seashore on a vacation trip can afford an automobile.

A FINE GARAGE.

Fireproof and Fitted for Storage, Painting and All Kinds of Repair Work.



The White Automobile Company has just completed the erection on Main street, opposite Halsted street, East Orange, N. J., a cement block and reinforced concrete garage of a two-story elevation, which will be used as the new home of the well-known White Steamer. This garage has a frontage of 50 feet and a depth of 175 feet, and is well equipped with a repair and paint shop that has no superior in the country. The roof of the main building is supported with five iron trusses, and the roof in the rear over the shop is supported with four iron columns and iron beams. The floor of the garage is of cement concrete, and has a pitch of 12 inches from either side to the center to a drain covered with an iron grating. This drain has a fall from either end to a catch basin in the center three feet in diameter and four feet deep. A four-inch iron pipe with trap runs from this basin to the sewer pipe. The catch basin is covered with an iron cover, which can be removed to clean out the dirt collected in

the basin and to clean out the trap and pipe to the sewer. In addition to the ordinary machinery of a well-equipped machine shop, a traveling crane, with a 16-foot span and a traveling space of 75 feet, is erected; also gas forges and other modern appliances. The machine shop occupies a space of 50 by 75 feet on the first floor, rear, and has an entrance to a driveway running the entire length of the building.

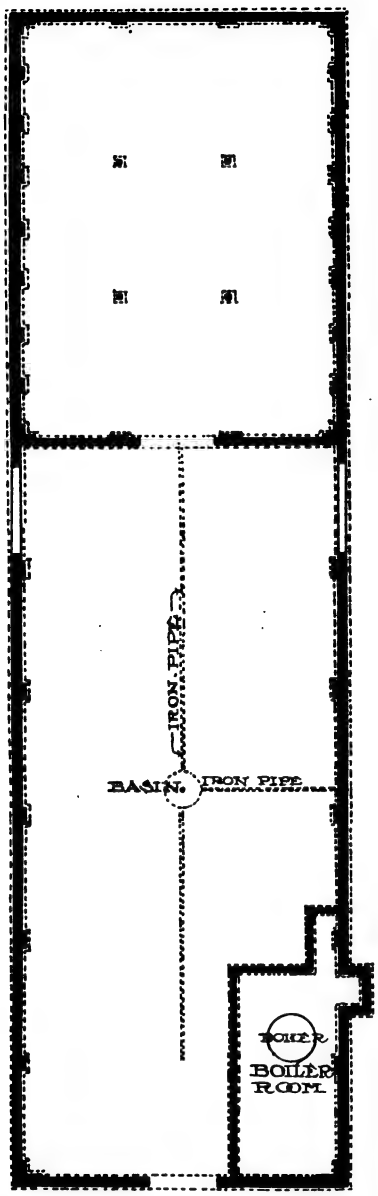
The front part of the garage contains general offices, private offices, a smoking room, ladies' retiring rooms, etc., furnished with Mission furniture. The second floor is constructed of reinforced concrete, making the entire building absolutely fireproof. On this floor an up-to-date paint shop is installed that can do automobile painting equal to any paint shop anywhere.

Four entrances have been provided, in addition to the door leading to the general offices.

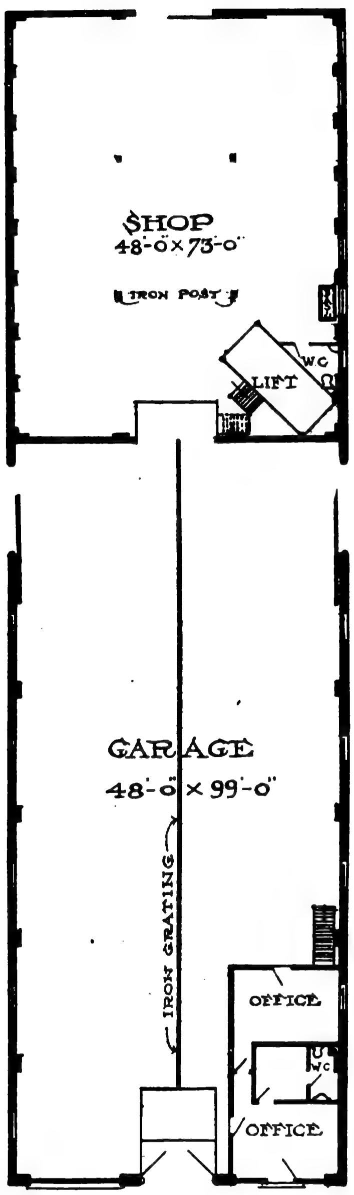
The building will be heated by steam and provided with elevators for carrying cars to and from the upper floor.

The manager of this branch of the White Automobile Company has spared no expense in making this an attractive garage, suited to the needs of the many owners of White Steamers in this section.

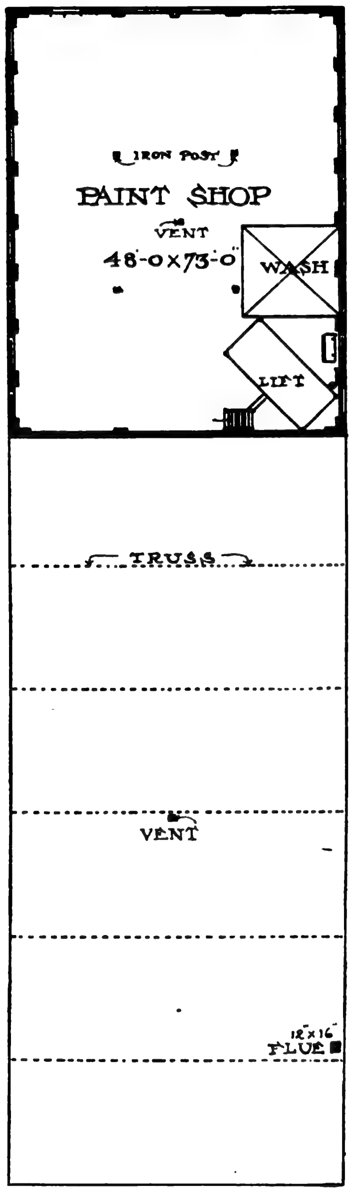
John E. Baker, the architect, of 828 Broad street, Newark, N. J., who designed the structure and all its details, has treated the subject most thoroughly, and has turned out what is undoubtedly one of the most up-to-date garages in the country for the use of the White Steamer.



FOUNDATION.



FIRST FLOOR.



SECOND FLOOR.

To Protect the Car Owner.

A German has invented a device for preventing tampering with a car in the absence of the owner, in the form of a key or bolt, which can be slipped through the neutral notch in the quadrant of the gear change mechanism and locked in that position.

When a fleeing burglar jumped into a railroad tunnel at New York City the police halted an automobile and used its headlights to aid in effecting his capture.

THE GARAGE

THE TWO CYCLE MOTOR.

Interesting Explanation of Its Merits by an Expert.

BY HARRY A. KNOX, PRESIDENT OF THE ATLAS MOTOR CAR CO.

The cycle of a gas engine is the completion of all the actions and functions necessary to obtain one impulse or power-stroke of the piston. If the cycle in an engine is completed in two strokes of the piston, or one revolution of the crank-shaft, it is called a two-cycle engine. If it takes four strokes of the piston, or two revolutions of the crank-shaft, to complete its cycle, it is called a four-cycle engine. The four actions completing the cycle of the modern gas engine are the suction, the compression, the impulse and the exhaust. The four-cycle engine takes one stroke of the piston to complete each action.

The modern two-cycle engine combines the suction and compression in one stroke. The impulse stroke also performs the initial compression in the crank case, this compression when transferred into the cylinder at the end of the power-stroke being the means of forcing out the exhaust remaining in the cylinder. All exhaust above atmospheric pressure escapes when the exhaust ports are opened by the piston at the end of the power-stroke. The cycle, involving these four actions, is therefore completed in two strokes of the piston, representing one revolution of the crank-shaft.

The first gas engine manufactured for public use was made in France in 1860 by Lenoir. This was a two-cycle engine and several hundred were manufactured for stationary purposes. There are three kinds of two-cycle engines.

First. Engines of the Lenoir type. This engine is now obsolete, as it did not compress its charge before ignition and was therefore very inefficient. This engine sucked a charge into the cylinder for one-half of the piston stroke. At this point the charge was ignited and expanded, giving an impulse to the piston in the last half of this stroke. The return stroke forced out the exhaust.

Another kind of two-cycle engine has in addition to the power cylinder another cylinder, used only for taking in and compressing the mixture. At the end of the power stroke the piston opens the exhaust ports and the compressed charge in the separate compressor is then transferred to the power cylinder through a valve or port in the head of the cylinder. On the return stroke of the piston the charge is compressed, its ignition at or near the end of this stroke giving an impulse to the piston through the next stroke. The separate compressor is generally connected or geared direct to the engine shaft so as to work in unison with the power piston. This type of engine is in common use to-day for stationary work, especially in Europe. It has never been applied to automobiles to any extent, due to the complication of the extra compressor.

The third type of two-cycle engine and the one most used to-day, especially in automobiles and launches, is the inclosed crank-case type, used because of its extreme simplicity, reliability and compactness. In this type the charge is sucked into the crank case through a port or valve by the up stroke of the piston. It is partly compressed in the crank case by the return or power stroke of the piston. Near the end of this stroke the piston passes over and opens, first, the exhaust ports, releasing the exhaust above atmospheric pressure, then immediately after opening the inlet or transfer ports. The compressed charge in the crank chamber is then released through these inlet ports into the cylinder, expelling the remaining exhaust. The up stroke of the piston compresses this charge and the ignition occurs near the upper end of this stroke. Seventy-five per cent. of all small, American built motor launches are equipped with this type of two-cycle engine.

Whatever prejudice there is to-day against the two-cycle engine is due largely to the unsatisfactory experience of owners whose boats have been equipped with very crudely designed, cheap and roughly built two-cycle engines. The wonderful ability of these motors to work, even when designed and built in the crudest manner, was the reason they were used.

Most of the early manufacturers of automobiles equipped their cars with four-cycle engines, not because this type had any natural advantages, but because it was much better known and had been improved and developed to a greater extent than the two-cycle type. They were at that time interested in the combination that could be manufactured and marketed in the quickest time and with the least effort on their part. The basic patents had also run out on four-cycle engines and the most improved engine of this type could be manufactured with no possibility of infringement or the necessity of paying royalties.

The public are now demanding an engine that not only runs, but that is of the simplest possible construction, with an abundance of power at all speeds and under all conditions giving silent, smooth running, with an easy, quick control of wide range, and the least possible friction, adjustment or replacement. It must also be light, compact and of a medium price. It must have all of the advantages of the best and most complicated automobile engines now in use without their disadvantages.

The following are the difficulties to overcome in applying the two-cycle engine to automobiles:

Difficult to obtain a wide and positive regulation of power and speed, especially at very high and low speeds, without missing impulses. To obtain efficient

and economical running under all conditions. To obtain proper lubrication. To prevent crank case leakage. To obtain a sufficient amount of power with a reasonable weight. The reversing of the motor. The carbonization in the ports. Carburetter troubles. Back firing in the crank case. Difficulty in adjusting bearings.

Automobile manufacturers have encountered more or less of these difficulties and after a few ineffectual efforts to overcome them they became discouraged and gave it up. The Elmore company is an exception. They have realized the advantage of this type of motor when it had been properly developed and perfected, and have persistently used it for several years on all cars manufactured by them. They deserve great credit for their far-sightedness and perseverance and for the results they are now obtaining.

Some of the numerous advantages of the latest and most improved type of two-cycle engines, especially for automobile work, are as follows: Its ability with one cylinder to give an impulse to the crank-shaft at every revolution, with but three moving or working engine parts, against the thirty or more moving and working parts in a four-cycle, two-cylinder engine that are necessary to obtain the same number of impulses. The ability to obtain ample power at all speeds with the least number of parts. The small, noisy, delicate, wearable, adjustable and breakable parts have been eliminated; the large, durable and non-adjustable parts only are the parts retained. The engines are silent, there being no noise except from the exhaust. Due to the simplicity and strength of the working parts great durability and reliability are obtained, with freedom from breakage and replacements.

An important advantage of the two-cycle motor is the smooth and even distribution and application of its power at all speeds, due to the great number of impulses. This means less wear and strain on clutches, transmissions, driving shafts, differentials, wheels and tires; in fact, on all the parts of the automobile and, incidentally, on the occupants. Necessarily this advantage greatly prolongs the life of all parts of the car.

Another advantage is that there is no knocking or hammering of connecting rods or engine bearings, even if they have considerable play, as there is always a continuous compression on the piston, in one direction. There is also a minimum wear on the bearings due to the same fact. The coolness of the crank case, kept so by the intake of the cold gasoline vapor, is an advantage, and the absence of adjustable parts is a large gain, especially appreciated by owner and operator.

A more positive ignition can be obtained, due to the constant compression in the cylinder at all speeds. Vibration is much less, as the vibration of an automobile engine at slow and intermediate speeds is due almost entirely to the recoil from the impulse stroke; or, in other words, the tendency of the cylinder and crank case to rotate around its crank-shaft in an opposite direction to the shaft's motion. This vibration is very objectionable and is very pronounced in motors that receive small number of large impulses, instead of a large number of small impulses. The greater number and the lightness of the impulses of the two-cylinder motor reduces this objection to a minimum. Very reliable operation in the two-cycle engine can be obtained, due to its few working parts and to their being non-adjustable, the ignition, lubrication and the carburetter being the only features requiring attention.

The two-cycle motor can be made very easy to start, as the transfer of the charge from the crank case into the cylinder is wholly independent of the speed of the motor and is very positive and certain at extremely low speed. This makes it very different to stall the engine, and makes it possible, also, when the engine is properly designed to obtain a slower engine speed than can be obtained with any other type. Again, as the ignition in each cylinder occurs at every revolution, the timing and distributing devices can be mounted directly on the engine shaft and not on an intermediate shaft, as is always required on a four-cylinder engine, and wherein the improper setting of the gears in assembling or repairing easily gives the wrong, and sometimes a dangerous, timing of the spark.

The compression end of the cylinder can be constructed without projections and with the least possible cylinder wall surface exposed to the gases, to absorb their heat. This means increased power efficiency, as about 40 per cent. of the heat energy in the fuel is lost through the cylinder walls. Every effort is being made to-day by four-cycle engine builders to reduce this exposed cylinder wall surface. The lack of valves in the head of the two-cylinder motor allows this to be easily accomplished.

A good two-cycle engine does not require an expert to operate and care for it. The cylinders can be removed for cleaning easily and quickly, as the water and exhaust connections are the only operating parts to be disconnected. Lubrication is much more positive and simpler than in other types of engines, as one feed, attached to the intake pipe, will lubricate any number of pistons. The strain on the crank-shaft is much less, due to the large number of small impulses, while, because of its simplicity, a light, compact motor can be manufactured containing the best material and workmanship at a medium price.

A Single-Cylinder Winner.

It may be of interest to those who favor many cylinders to know that in a recent long distance run from Jacksonville to Miami, Ind., 371 miles, a single cylinder Cadillac car, driven by a physician, took the first prize. The car, which is of but ten horsepower, led its nearest competitor by seventy-five miles in a total distance of 371 miles over some of the worst roads in the country. It was pitted against nine other machines, some of which ran as high as thirty horsepower. Dr. Stinson carried three persons in his machine, and his official running time was 37 hours, 19 minutes, the actual running time being but 30 hours, 15 minutes.

Gasoline Vapor in the Pit.

Gasolene vapor can not be driven out of an inspection pit after it is once in, except possibly by "fanning" it out. The vapor is harmless, until a naked light is carried into the pit, or match struck. If there is a gassy smell about it it is not safe to bring any light except an electric or an enclosed lamp such as miners use into the pit.

TIRE TROUBLES.

Claim That They are Largely Due to Careless Inflation.

"There is no question or doubt but that the tire expense is one of the biggest items that the motorist has to contend with to-day," says George Johnson, Pacific Coast manager of the Fisk Rubber Company. "That in most cases the trouble is due to ignorance on the part of the driver has been proved by several leading tire manufacturers of this country. One manufacturer made a test on different weight cars with tires inflated at different pressures, keeping a record of several different tires.

"On a six-cylinder car carrying a 36x5 tire, the test was made on the two rear tires, one inflated to sixty pounds pressure and the other to ninety-five pounds pressure. These tires were tested up every day and the pressure kept up to this point in both tires. Out of three pairs of tires tested, the average mileage for the tire carrying sixty pounds was 2,250 miles; while the average of the tire carrying ninety-five pounds was 4,500 miles.

"It seems strange that a motor car driver or owner should expect a tire to stand up and give service when not properly inflated, any more than they would expect a steam boiler to last and do its work when not kept sufficiently filled with water. The working parts of an automobile would not give the proper wear if they were not kept oiled. Yet the average motorist will take care of every part of his machine and neglect his tires.

"A familiar expression to the tireman which is made by the motorist is that the fabric in certain tires seems rotten. This is certainly a mistaken idea. All of the best-known tire makers use nothing but Sea Island cotton fabric, which is absolutely the most durable that can be bought, and it runs in uniform quality.

"The impression that the fabric is rotten in any particular tire that has blown out is due to its appearance of having been pulverized or chewed up, which appearance is due almost entirely to the tire having been run without sufficient air pressure, thus causing it to flatten out under the weight of the car, causing a hinge on each side of the tread and constant work on this hinge; when the tire must stand this for mile after mile it is bound to chew it out, as it would anything regardless of what material it was made. Whereas, if the car was kept round under the weight of the car, this hinge would not be caused.

"Since the fabric is really the whole body of a tire, the outer rubber covering merely being to protect the fabric against water and wear of the contact with the road, the life and service of the tire must depend upon the treatment it gets from the driver. A good many motorists will tell you that a car rides too hard if the tires are inflated with the proper pressure, but those who prefer this luxury must expect to pay for it in tire expense.

"The average motorist who starts out on the road for a long, fast drive will let some of the air out of his tires—if they do not already show some depression under the weight of the car—claiming the air pressure will expand when the tire becomes heated. As a matter of fact, a tire will not heat nearly as much when inflated up to its capacity as it will when only partially inflated, as the heat is caused by the friction in the working of the tire. If the proper inflation is kept in a tire, there should be no fear of over-inflation when it becomes heated.

Death of Byron J. Carter.

Byron J. Carter, vice-president and general superintendent of the Motorcar Company of Detroit, died at his home, 512 Commonwealth avenue, that city, Monday morning, April 6, ater a week's struggle with pneumonia. Mr. Carter was the inventor of the friction drive for use in an automobile, and the Cartercar bears his name. He had been actively identified with the industry from its inception in Michigan. In 1887 he became an enthusiastic bicyclist and was a charter member of the Jackson Bicycle Club. He ran a bicycle store and began experiments with a gasoline motor. This was abandoned for steam and cars of this type were built in his shop from the hubs up. These cars were raced at a circuit of fairs and attracted much

BYRON J. CARTER.

attention. After running two of these machines to the Pan American Exposition, the Jackson Automobile Company was organized to build the cars, with Mr. Carter as general manager. He then designed a single cylinder runabout which became very popular.

In 1903 his resignation was sent in, that he might work out his ideas regarding the friction drive. It proved a success and business men from Detroit who went to Jackson for a demonstration, became so enthusiastic that The Motorcar Company was organized at once and the cars placed upon the market. The friction drive to-day is practically the same as when he first invented it. While the idea met with much oposition at first, Mr. Carter was much pleased to see twenty-one cars with friction drives at the recent Chicago show.

He leaves a widow and three children to mourn his death. The interment was made at Jackson, Mich., his former home.

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ADVERTISING RATES MADE KNOWN ON APPLICATION.

NEW YORK, APRIL, 1908.

Missing Numbers—Our readers are requested to remember that it always gives us pleasure to re-send numbers which have gone astray in the mails.

GETTING RID OF SHOCK.

Those who are studying the tire question with a view of devising some substitute for the pneumatic tire should not forget that the perfection of resiliency is where the shock is absorbed right at the rim. For illustration, let us suppose the pneumatic tire runs over a pebble or other small obstruction in the road; if such obstruction is smaller than the surface space of the contact between the road and the tire it will "dent in" the tire, so to speak, and thus not raise the car or give any shock whatever. On the other hand, in case of spring wheels or other devices, something may be used that makes riding quite as comfortable, but nothing yet has been invented or can be invented for getting rid of the shock so completely as the pneumatic tire, right where it strikes the car and at the periphery of the wheel.

Of course, in the case of a depression in the highway the foregoing does not apply so fully, because a pneumatic tire as well as a hard tire will sink into a hollow in the road and cause a shock, although not to so great an extent. But there is nothing so well designed to eliminate shock at the rim of the wheel as the pneumatic tire, and there is no place where it is so necessary to have the shock eliminated as at the rim of the wheel. Moreover, it is far more essential in the case of an automobile that shock be reduced to the lowest extent than it is in the case of a horse-drawn vehicle; first, because of the delicate machinery of the chassis, which should not be subject to too much vibration; second, because of the added weight of the car, and third, because the car is driven twice or three times faster than the horse-drawn vehicle.

HODGE PODGE OF LAW.

If a given speed under certain conditions is safe in one State, why should not the same speed under the same conditions be safe in another? If a given sum is sufficient for license in one State, why should not the same sum be sufficient in another? If non-residents are exempt from registration and licensing in one State, why should they not be in another?

Greater uniformity of automobile laws in the various States is sorely needed, and there is no doubt that the federal government should have something to say about such laws. But whether it now has the power to do so is another matter. There are two distinct sovereignties in this country, the State and the United States, and each is distinct and independent of the other in many matters, but as the United States has the power of controlling interstate traffic, we see no reason why a general federal law should not be enacted, nor why such a law should not receive the sanction and the approbation of the States.

AN EASY WAY OUT.

There is one way that the problem of springs, shock absorbers, pneumatic tires, the necessity of great weight and strength in car construction, and the use of so much gasoline for a given amount of transportation, may be easily solved.

How? Why, it is easy enough. Work along the line of cause rather than effect, and according to the sensible rule that "a straight line is the shortest distance between two given points."

Suppose car builders and owners and garage keepers and chauffeurs unite in an effort to secure smooth, hard and practically indestructible highways? Suppose a tithe of the time, effort and money that are now spent in trying to overcome—and not succeeding—the effect of highways as they now exist, were expended for this purpose?

Pneumatic tires and so-called "spring wheels" are worse than useless on smooth and hard highways. Shock absorbers or especially strong and easy springs are out of place on smooth and hard highways. The necessity for so much weight and strength in car construction would be avoided with smooth and hard highways. Anywhere from 10 to 95 per cent. of the expense for gasoline for car propulsion might be saved with smooth and hard highways. The life of the car would be from twice to four times as long with smooth and hard highways.

Little wonder then that New Jersey is going to experiment with a new, dustless, indestructible road especially suited to automobiling. The surface of an old road is to be thoroughly pulverized, and over it is to be sprinkled a binder of liquid asphalt heated to 350 degrees Fahrenheit. A finish will be applied with a steam roller. If the idea proves successful, it will put that state to the fore front of enterprise in the great transportation revolution.

MAY SOLVE A VEXING PROBLEM.

The automobile will finally make a heavy inroad into the steam railway and trolley business. Already many people of wealth are using the car for what may be called long distance riding—50 to 200 miles—when they formerly used the steam railway coach. They not only find this way of travelling pleasanter and more convenient, as it makes schedule time and the consultation of railway time tables unnecessary, but in many cases it is less expensive since the cost of the maintenance of their car must be met whether they use it much or little.

This tendency will continue to grow, until in a few years there will be public automobile lines just as there were formerly stage lines. In less than ten years from now there will be regular public automobile lines between New York and Philadelphia.

May not the automobile be a possible final solution of the present railway monopoly problem? With smooth and substantial public highways, which may be used by all

who desire, it is impossible to conceive of transportation monopoly or of the necessity for either so-called government control or government ownership.

It is thus that the "whirligig of time" often solves great problems, not only in the ways not expected but easily and according to the wholesome law of competition.

AMOUNT OF FUEL CONSUMED.

"How far should a car run on a gallon of gasoline?" This question is about as easily answered as to ask, "What is a yard of cloth worth?"

The distance a car should run on a gallon of gasoline depends upon a dozen extremely important considerations, more or less. It depends upon the car, upon the tires, upon the grades encountered, upon the load, upon the way the car is driven, upon the quality of the gasoline, upon the condition of the road, upon the speed, upon the condition of the car, and upon sundry other matters of less importance.

Take, for instance, two perfectly level pieces of macadam road, and in a test it will require twice the amount of gasoline to propel the car over the same distance on one as on the other. Nor will a superficial glance show which piece of road requires less in the matter of draft. The quality and amount of top dressing alone on different pieces of macadam road may cause the power of propulsion to vary one-half.

Economy tests, where cars are in perfect condition and drivers are of equal ability, are instructive and useful, but the ordinary statement as to the amount of gasoline that is consumed in driving a car a given distance is about as illuminating as to give the price of a yard of cloth and not state its quality or width.

SPEED LAWS.

All speed rate laws regarding the automobile will be repealed before long and drivers or owners will simply be held to the same measure of responsibility that controls all other drivers of vehicles.

There are times when a car may be safely driven at whatever speed the occupants choose, and there are other times when it is dangerous to run it at even a far slower speed than the law allows. No fixed speed law can be passed that will be at all times and occasions fair to both the car driver and the public. "Reckless speed" may be two miles an hour in one case and safe speed may be fifty miles an hour in another, and each on the same road or street.

And when the law is fixed so that a car must not be driven at a speed which it not "reasonable and proper," there will be far less conflict of testimony between car occupants and officers of the law.

A careless man may do a whole lot of damage by reckless driving and still keep within the present speed laws, and a careful one may run his car much faster than the present law allows and yet not do any damage.

It will always be thus so long as unlawful speed is fixed at some numerical number of miles per hour.

NOT A LUXURY.

When the late and unlamented panic was doing its fell work it was phophesied that the automobile business would feel its effect more than anything else because the car is "a luxury." But the fact is, the car is as much a necessity as anything else that offers a better or cheaper way to accomplish business or further pleasure. Indeed, the greatest need of a car is when times are bad, because then it is that economy is most imperative.

In point of fact, the panic disturbed the automobile business less than almost any other of similar importance and character. Many factories are selling more cars than ever before, and they cannot begin to keep up with their orders. In some cases they are running night and day with two shifts of workmen.

Of course, in the case of pleasure cars purely, hard times have their effect, unless it is where the owner ot horses sells them to substitute an automobile purely as a step in economy, but not otherwise.

SPEED CONTESTS.

Hill climbing contests are useful to the public in determining certain comparative merits of automobiles, but like all other speed contests they are not conclusive. In the recent hill climbing contest at Fort George in New York City, where there were eighty-five entries in eleven different classes, an Apperson "Jack Rabbit" rushed up the steep course of 1,900 feet in 36 seconds, and a White steam racing car took it in 32 1-5 seconds A 60-horse power special Fiat made the distance in 37 seconds, going as straight as a die and with apparently plenty of reserve force behind that which was needed for the ascent.

But many of the cars were handled badly. Some drivers evidently did not know that extraneous weight would be a handicap, and others seemed to forget that a smooth track is easier to negotiate than a rough one, or that other things being equal, a straight line is better than a crooked one for getting up a hill.

The foregoing and various other facts being taken into consideration, the results of the contest referred to and of all others should be taken with some allowance.

ACCIDENTS ARE DECREASING.

The record of automobile accidents is rapidly decreasing. As we have stated again and again, the automobile is the safest and most easily controlled vehicle that has ever been used. If horse-drawn vehicles were driven at half its average speed there would be such a record of death and destruction in their wake that few would trust their lives in them.

It will be remembered that in the early days of the bicycle reckless riding was simply astounding, but the lessons of experience and of example have mostly corrected it, and at the present time the average bicyclist seems to be fairly rational. As was the case with the wheel, most car accidents are due to the "speed craze." But speeding endangers the life of those in the car; it endangers the lives of others; it is likely to destroy or injure a valuable and useful vehicle; it is injurious to the highways; and it is neither a dignified nor a pleasing spectacle.

NO RACE IN ALASKA.

If the New York and Paris race contestants had listened to our advice of some four or five weeks ago, they might have spared themselves a trip of several thousand miles for nothing. Indeed, we stated as long ago as last fall that the chances were much against taking an automobile across Alaska, although it is not an impossibility, if the car were on the ground at the right time. But to think of taking an automobile from Valdez over the pass to Fairbanks so late in the season was simply out of the question.

The contestants had difficulty enough in getting across the United States during bad weather, as any rational man might have expected; but compared to crossing Alaska such a trip is like a ride in a driving park.

TOO STIMULATING.

Garage keepers and car owners would do well to make it a rule that no one shall drive a car for them unless he is a total abstainer from alcoholic liquors. And we say this without having the opinion that prohibition laws do much for the cause of temperance.

But there are several strong reasons why car drivers should be total abstainers. The exuberance of feeling incident to the act of driving a car is of no small importance, but when to that feeling is added the influence of a "highball" or two, it is almost sure to create recklessness. Moreover, the man who takes only an occasional drink is more to be feared than the one who drinks constantly, for the single drink is more likely to upset normal feelings and caution than steady drinking.

Another reason for total abstinence on the part of car drivers is the fact that automobile riding and especially driving is in itself a decided stimulant and all that is ever necessary. Anything more is almost sure to inspire recklessness.

There may possibly be some excuse for a man to take a drink who has been working for ten long hours in a shop or factory, or even in the case of one who has applied himself to the strain of mental effort alone for that number of hours. But for a car driver to want a tonic or bracer is like taking "coals to Newcastle;" it is too much of a good thing.

AUTOMOBILES FOR HIRE.

In a few years there will be more automobile liveries than horse liveries. But cars will not be let out without drivers unless in rare instances where it is known that the person hiring the car is not only perfectly able to handle it properly, but that he can be depended upon to give it proper care and to return it in good condition. As a rule, drivers will be provided from the garage. Naturally, the charges for automobile hire will be much more than for a horse and carriage, but on the other hand, the car will go about three times as far as the horse.

There is a good business in many localities for those who will put in a stock of cars specially for livery purposes. In some of the medium sized cities of the west where the roads are fairly good in the outlying country, there are already more automobiles in demand than can be supplied, and the garage keepers are constantly increasing their stock of cars for renting purposes.

CARS FOR RETAIL DELIVERY.

There is a good business for a man in scores of small cities all over the country in delivering goods by automobiles for the retail trade. In most such instances several retail firms should be secured to turn all such work over and they can thus get it done more expeditiously and economically than by any other method. One car can not only do the work of two horse drawn vehicles, but it can make deliveries far more promptly.

Dealers may well look up some man in their own locality and explain the oportunity to him, and then of course, sell him the car to do the work.

There is a steadily increasing demand for second-hand touring cars from business men, who remove the old bodies and replace them with those of express wagons or other vehicles, for which they want to use them.

Racing the motor while idle and worrying it over grades on the direct drive will do more to shorten its life than almost anything else.

THE FELLOW AT THE WHEEL.

BY C. L. BAILEY.

We read the wonderous records
  Of the various makes of cars,
How they've done almost unheard of stunts
  With neither breaks nor mars.
And after we have read them all,
  We cannot help but feel
There's a mighty lot depending
  On the fellow at the wheel.
We've studied close the Glidden tour,
  From known effects to cause;
From mishaps which occurred en route,
  Back to constructive laws;
And putting by all preference,
  All selfish pride and zeal,
We're forced to say, it's not the car,
  But the fellow at the wheel,
Who should have had the penal mark
  Or the credit for the score,
If he trotted in on schedule time,
  Or limped in late and sore.
This assertion we are confident
  Bears truth's eternal seal:
It's not so much the kind of car,
  As the fellow at the wheel.
We've seen an antique rattle-trap
  Go waltzing up a grade,
And, following it, a modern car
  (Among the best that's made)
Lay down and put its driver
  Up against things which were real,
But it was not owing to the cars—
  'Twas the fellows at the wheel.
The fellow at the wheel,
  He counts more than all beside.
'Tis the fellow at the wheel
  Who makes or mars your ride,
And the car which makes a record,
  Whether one of woe or weal;
Before you curse or praise the car,
  Know who was at the wheel.

Various Ignition Methods.

Only about four years ago the almost universal source of current for an ignition system was a set of dry cells used in connection with the jump spark or "make and break" system. The storage battery as a more reliable source of electricity was at first considered out of the question on account of the increased initial cost over a set of dry cells; but this objection soon proved to be without foundation when the longer life of the battery and increased efficiency of the engine were demonstrated.

The storage battery requires recharging about every five weeks to keep it in good condition. This only requires about ten hours, and if attended to properly does not cause any serious inconvenience, but the tendency in the development of automobiles is naturally toward a reduction in the care which a battery necessitates as much as possible.

This has led, in many cases, to the adoption of the magneto. To meet this demand a rotary type magneto was placed on the market. It is not to be supposed that any magneto entirely eliminates all chance of ignition troubles, as it also requires considerable attention and is more or less difficult to repair in case of damage. The first cost is several times that of a battery, which makes it impracticable for the so-called low and medium priced cars.

THE REPAIR SHOP

REPAIR WORK AND TOOLS FOR BEGINNERS.

A Few Simple Points That May Be of Use to the Beginner in Repair Work.

(Continued.)

A very useful tool is an emery grinder. The writer prefers those worked by a treadle, as the hands are free to hold anything to be ground. It is a bad plan to use an emery wheel in a lathe; the lathe does not run fast enough, and the dust from the wheel must be injurious to the surfaces of the lathe.

The motorist and repair man should know how to grind in valves. The exhaust valves, owing to the great heat, require more attention than the inlet valves. An exhaust valve will sometimes stick or hang up from dirt. This is more frequent with engines using an excess of gasoline, or from using too much lubricating oil, or oil that is not suitable.

If the engine loses compression or is sluggish, especially uphill, the valves should be examined. If, when taken out, the seating is black and dirty, they must be ground in. In most exhaust valves there is a slot in the head for a screwdriver. The port leading to the cylinder should be stopped up with cotton waste to prevent the emery from getting into it, but the motorist must be careful not to forget to remove the waste after grinding. Oil and fine emery must be smeared on the seating of the valve; the proper emery can be obtained from a hardware dealer. Then with a screwdriver the valve must be turned round on its seating, occasionally being lifted so as to move the grains of emery. This should be continued, emery and oil being added as required till the seating is bright and clean, when all traces of emery must be removed with waste or a cleaning cloth. When a valve is in a very bad condition, it may be an hour's work to get it right. Small brass cocks should not be ground with emery for the emery appears to be too hard for brass, and a grain may be embedded in the metal, and then it is almost impossible to get the cock tight. The writer has

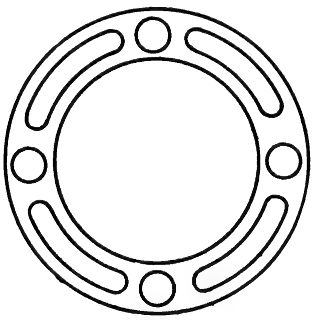


FIG. 1.

found bath brick, such as is used for whitening and cleaning, to answer very well. The bath brick should be scraped with a knife, and the powder mixed with a little oil.

In some engines the joint which secures the head to the cylinder forms also the joint for the circulating water. This joint requires great care in making. The repair man should cut out a template of tin plate or zinc the size required (Fig. 1), but the holes in the jointing material, through which the long studs pass, must be 1-16 inch larger than the studs; for if there is not this clearance, and the jointing material has to be pushed on, most probably the edge will be pushed up alongside the stud; and when the head is put on, it will be turned back so that for a small distance round the stud there will be two thicknesses of jointing material, and then it will be impossible to get a tight joint.

If the jointing material when put in be smeared with blacklead on one side, preferably the upper side, the head can be taken off without damaging the material. Two or three of these "joints" or "packings" should be carried in the car—not loose in the tool-box, but tied up between two pieces of stout cardboard.

In chain-driven cars the teeth of the sprocket wheels become worn with use, and after some time, if they are

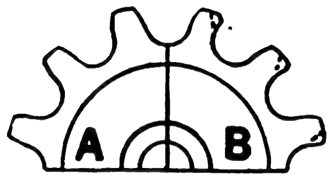


FIG. 2.

not attended to become veritable hooks, so that the chains will not leave the sprockets without a jerk; this may cause a serious accident by the chain becoming jammed and not leaving the sprocket.

In Figure 2 the teeth on the left hand side at A are in their original form; those at B on the right are worn, and being curved will cause the chain to hang, so that the tops of the teeth must be filed away as shown by the dots, to bring them to something like their original state. In many cars with side chains these can easily be filed up in place without removing the sprocket, but when there is only one chain and a central drive it is almost impossible to do this, and it may necessitate the dismantling of the engine or gear case.

Most people have some idea of what a lathe is. The origin of the lathe is lost in antiquity. Some sort of turning lathe must have been used by the Greeks and Romans. The reader will get a far better idea of a lathe by looking at one than by reading a description. In the present day there is hardly a country town that has not a machine shop so that there ought to be no difficulty in getting a good look at a lathe.

But the lathe of the present day is essentially an invention of the nineteenth century called into existence by the necessity of quick and accurate work. The sizes of lathes are expressed by the terms 3 inch, 4 inch, 5 inch lathe, etc.; that is the distance of the centre of the lathe from the bed. Thus, in a 3 inch lathe the largest object that will go round is 6 inches in diameter, but then the slide-rest or saddle takes up some space—at least an inch or more. If the object is narrow and a disc, so that it can be fixed on the face plate or held in a chuck, and the slide rest kept on one side, the full swing of the lathe can be used.

There is generally a gap in the lathe bed. By removing the cover plate of the gap a much larger object can be turned In looking at a lathe (Fig. 3) the reader will notice on the left a casting technically called the headstock In this runs the mandrill, with a screw at its right

end to attach the face plate, chucks, etc. On the mandrill is a pulley with either three or four V's for the gut or round belt, or the pulleys may be flat for flat belts. On the flywheel are corresponding V's, the larger one opposite the small V on the mandril. This gives the highest speed, which is used for wood-turning, also for light brasswork. When the belt is on the large mandril V the speed of the lathe is less; this is used for turning up iron rods and bolts of small diameter. But this speed would

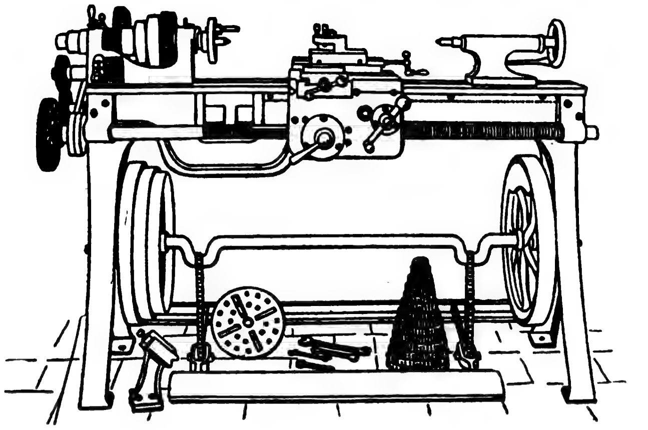


FIG. 3.

be too great for turning up any large object, or on a small lathe even a 1-inch rod; therefore the back gear is employed. The back gear consists of two small pinions and two larger spur wheels. This is thrown into gear by sliding the back shaft till pinions and wheels engage. This would lock the gear so that the lathe could not be rotated. To allow the V pulleys to run free, a nut in the face of the spur wheel on the mandril must be loosened; this allows the bolt connecting the V pulley to the spur wheel to drop out of its catch, and come nearer the centre of the mandril (the nut must be tightened in this position) and now the motion is transmitted through the back gear to the mandril, which revolves at a much lower speed.

Figure 4 is a section of a lathe headstock, the back gear being omitted. A is the mandril; it runs in a coni-

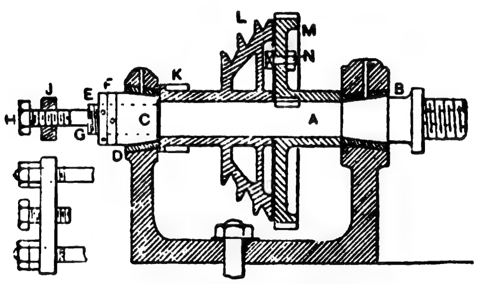


FIG. 4.

cal steel bush B at its right-hand end. At the left end is another conical bearing D. On the mandril is fitted the conical piece C, which is kept from turning round by a key let into the mandril. To keep it up to its place and allow for wear, the end of the mandril has a fine thread cut on it, shown at E. Two ring nuts F are threaded on this, and can be turned by a rod or "tommy" which can be inserted in holes drilled in the nuts. These push the cone C into its place and are then locked. These nuts must be screwed up so that there is no shake in the mandril. The end of the mandril G bears against a screw H carried in a bracket J, which is fixed to the headstock by two studs. The bracket is also shown in plan beneath. Some workers when drilling with the lathe, when there is only an end thrust and a little shake is of no importance, slack back the cone C, so that G should bear on H; the lathe then runs more easily. K is the pinion of the back gear, and is either attached to the V pulleys L or is part of the same casting. This runs free on the mandril. The large spur wheel M into which the pinion on the back gear gears, is keyed to the mandril. N is the locking bolt, which connects the V pulleys to the spur wheel.

The hand-rest for wood-turning is a T-shaped forging or casting, fitting into a socket on a plate or casting bolted across the lathe bed. The slide-rest consists of a casting carrying the tool-holder. It will be noticed that this has two motions at right angles to each other, the tool-holder running on two slides, technically termed V's (as they are planed at an acute angle) and it is moved by two screws turned round by two short crank handles. One motion is parallel with the length of the lathe bed; the other to and from the lathe centre. The ordinary slide-rest is clamped by a screw with a nut or handle in any position which may be required.

It will be noticed that the nose of the mandril contains a taper hole. In this fits the lathe centre, a hardened steel point. The other centre is in the headstock—a movable casting at the right of the lathe. This, like the slide-rest, is clamped where required, the hand wheel at the right bringing up the fixed centre (so termed because it does not revolve) to its work by means of a screw. To

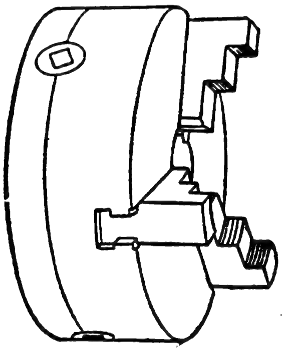


FIG. 5.

prevent this screw working loose, it is clamped by a wedge or bolt, which is tightened by a short handle, usually placed at the further side of the headstock.

The face plate is a plate of nearly as large a diameter as will go round in the lathe, and is screwed on to the mandril nose. In Fig. 3 the face plate may be noticed on the ground near the left-hand crank. In the face plate are holes and slots for bolts for holding any work on it. But it would not be possible to hold a small object, such as a small cylinder, on the face plate so chucks have to be used. The bell chuck is a useful chuck; this is somewhat in the shape of a bell (hence the name); but the sides are parallel, and in it are either six or eight screws, with their points to the centre for holding any object, such as a rod or cylinder, that has to have its end turned, or that requires boring. The American self-centring chucks are very good—three dogs work radially by means of a scroll or spiral groove inside the chuck. One is seen in Fig. 5. Small chucks for carrying drills are made on this principle.

(To be continued.)

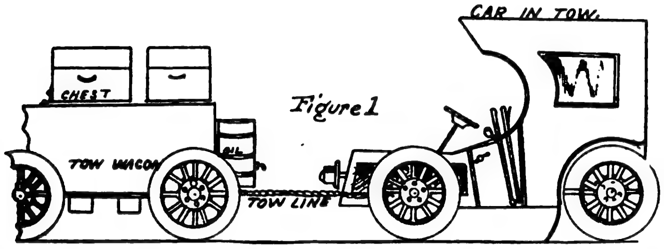
Acetylene Lamps.

In using acetylene lamps a reserve supply of carbide in an airtight can, several new burners and some fine cleaning wire should be carried, and before setting out for a long run the motorist should take the trouble to see that the generator is charged with both carbide and water.

AUTOMOBILE TOWING.

Some Suggestions as to the Proper Ways to Bring in a Car When It Is Broken Down.

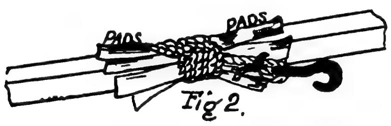
Every repair man has more or less to do with the towing of broken-down motor vehicles. Almost as soon as he gets his shop established and his sign out some one sends him word to go out and get a machine which is stranded along the road. If the new repair man has a telephone and is in connection with outlying districts, he finds that he obtains a great deal of business by these hurry-up calls from the counrty roads. It is a good plan for the old shops to be properly equipped for receiving messages from the motor-ways so as to get into touch with the autoists



who are seeking aid along the roads. There is not only the towing price to be obtained, but if you do the towing yourself you are sure of getting the broken-down automobile to your own shop.

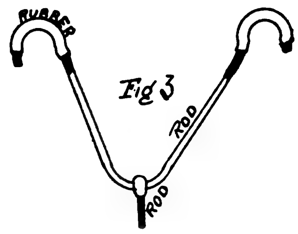
When the owners of the stranded machines apply to the farmers for a tow into town to the repair shop, the chances are that the farmer towman will take the outfit to the nearest shop, or perhaps to a friend of his. I am aware of the fact that the farmers along the roads where considerable motoring is done are in touch with some of the motor repair shops in town to the extent of hauling machines to these specially chosen shops. In return the farmer is rewarded in some way. In remote cases I have heard of fees being paid to farmer boys who have towed a machine to a certain shop for repairs. In this way the towing party obtains pay from two sources.

The repair man who has his telephone communications with the motoring road houses, or who has one or more towing machines out on the road, does not have to depend upon the caprices of the expressmen or the farm-

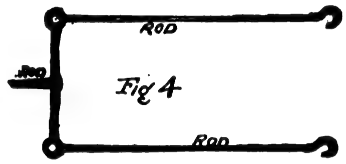


ers when a tow is brought in. He can locate his car and haul it direct to his shop for treatment. Some of the well-established shops have adopted quite perfect systems of towing, something after the fashion of the wrecking train and crew of the steam railroad. A motor vehicle is specially fitted up as a wrecking and towing machine. It is a selected machine, being powerful, fast and roomy, so that equipments may be taken along for repairing road breaks.

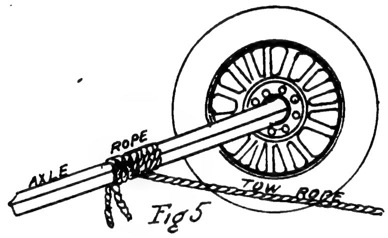
Fig. 1 is a drawing showing a section of one of the wrecking machines I saw. The body of the car is made so as to carry quite an assortment of extra parts. Extra wheels and tires of various sizes are there. The necessary selection of tools and repair machinery is taken along for road service, so that often times when the broken down machine is reached alongside the roadway, the necessary repairs can be made right there and the necessity of towing into town is averted. However, the outfit is a towing one, and all of the required fittings for making fast to a tow are taken along. This matter of connecting up with a tow is of more importance than is usually supposed. It is often thought that all that need be done is to take a rope and make fast to some part of the front of the automobile to be towed in. Ordinarily a rope is carried for the purpose. In some cases chains are taken along, and I have seen some serious damage done with chains on the en-



amelled surfaces of the automobile in tow. There are hooks, clamps and braces used in the line of towing. And some of the cumbersome contrivances which one sees in use for this work are very curious. I have seen portions of modern automobiles quite demolished by the reckless connecting up of a car in tow.

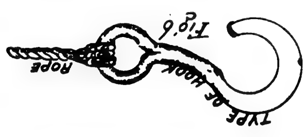


Sometimes an accident will occur while the towing is in progress, resulting in the crude connections with the tow breaking some part of the machine. I have seen a tow strike a tree and get its forward axle sprung. I have observed cases in which machines in but slight disorder have been quite completely wrecked while being towed to the shop. The other day a party going at high speed with



a tow tried to make a turn in the street, resulting in throwing the towing car up on a lamp-post, demolishing one side of the car.

When the hurry call comes to the shop for a tow, some men grasp a rope and run for it with the towing car. They get out to the wrecked machine ahead of other repair men. All is haste. A rope is bound about the rear axle of the tow with some pads of cardboard or leather to protect the axle and also to keep the rope from being chafed. This is shown in Fig. 2. The chances are that the combination

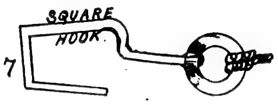


will loosen and work to one side a dozen times ere the shop is reached. Therefore some men use a hooking device like that in Fig. 3, the hooks of which are covered with rubber tubing slipped on, to prevent the metal of the rods injuring the connection at the car. This style of connection is liable to double up.

The best forms of tow unions are the kind similar to the rod connections used on electrical street cars, when one car is required to push another. With the stiff connection it is possible for the towing car to control the

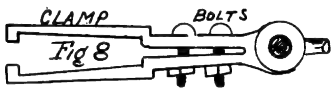
tow. Otherwise the car in tow might jam up against the towing car unless there is some one in the car in tow to regulate the brake and speed. I know of instances in which the fronts of cars in tow have been seriously damaged by bucking the towing car on a down grade, or when the towing car comes to a sudden stop. Hence the style of stiff rod connection shown in Fig. 4 is used to good advantage, as the party in the front machine can fully control the movements of the machine in tow. Still the plan of making a tow line connection to an axle prevails as in Fig. 5. But it is not safe. Even the hook shown in Fig. 6 is employed by some men.

I know that some repair men make no provision whatever for emergency calls for a tow. They may have an

Fig 7


automobile ready with a few tools and a rope in it, but that is all. They have to tie on the tow with the rope as in Fig. 5, or trust to the slipshod hook, as in Fig. 6. The hook will slip back and forth on an axle. It will scratch all of the surfacing off from whatever object it is fastened on. I saw types of square hooks in use in some shops, to fit over square axles in tows. Sometimes these bulky metal hooks are fastened on the projecting parts of the frame of an automobile. When the tow arrives at the shop there is a job to do on the frame where the hook was joined on.

Then there are clamps in service in some shops, all in readiness to apply to some convenient projection on the



car to be towed. In fact, one can find all kinds of contrivances and all calculated for making fast to tows. It is a good plan to have some rubber covered stiff projecting hooks, something after the order of the combinations in Figs. 7 and 8. These can be adjusted so as to make connection with towing links on a machine, and the machine can be controlled and will not be damaged. Some builders of cars take it for granted that their machines will be towed at sometime, and therefore fasten a handy link near the front, just beneath the car, so that a hook of a towing device can be adjusted. But as a rule, you have to find some convenient part of the car to make fast to.

Watch the Little Clips.

Watch closely the small clips that are so often employed to bind the outer leaves of the ordinary elliptical springs together. These ought to be held firmly in their places, and if they are broken or lost should be replaced immediately. Unless the clips are replaced when they have been lost or broken the stress is brought almost entirely on the inside leaf, when the spring is subjected to a heavy rebounding action, and unless it is much stronger than necessary for its usual task there is great likelihood of it being broken.

Cause of a Smoky Exhaust.

Smoke coming from the exhaust of a gasoline motor may be due to over lubrication, too much lubricating oil being fed to the cylinder of the motor; or too rich a mixture, that is, to much gasoline and an insufficient supply of air. The first condition may be readily detected by the smell of burned oil and a yellowish smoke. The second by a dense white smoke accompanied by a pungent odor.

THE TIRE PROBLEM.

Recent Developments in Shoes, Tubes and Rims Help Solve It.

When the pneumatic tire first came into use, says Hiram P. Maxim, it startled us. It seemed nothing short of monstrous and grotesque. And as for uncertainty and unreliability, what could beat it? If stones and bits of metal would cut and hack a solid or a cushion tire what would they do to this thinner tire filled with such an elusive substance as compressed air?

But strange as it seemed, the tire bounded into popularity. Its inherent qualifications were such that it lived down all its difficulties. It made the bicycle the success it was beyond the question of a doubt. The common road, with its rough stones, ruts and soft spots, became ridable to a degree that was not possible with the solid tire even on the best pavement.

On the heels of the successful bicycle there came the motor vehicle. It followed as the natural successor of the bicycle. If one person could propel himself, why could not a motor be made which would propel several people, and at higher speeds? It could be, and it was. But what about the tire in the meantime? The immense increase in power and speed the moment the motor car came and supplanted the man's legs caught the pneumatic tire unprepared. Its inherent weaknesses came to the surface with tremendous force and for a time threatened further progress.

To those who had not been identified with the development of the tire problem from its beginning the temptation was irresistible to revert back to the solid or the cushion form. The pneumatic was assailed by substitutes harder than ever, and every conceivable kind of a device was brought forth as a solution. For commercial work a reversion to first principles seemed best, as street surfaces had vastly improved, and as the commercial wagon was practically confined to city streets the solid tire seemed the best compromise.

It, however, is limited to speeds of twenty miles an hour, and as this is by no means a satisfactory speed for pleasure cars the solid tire did not offer the latter any improvement. In fact, wherever speeds were high, and safety desired the supreme fitness of the pneumatic tire for the purpose of the pleasure car demanded its retention. When this fact became recognized generally it was not long before men's minds turned to ways and means to mitigate the disagreeable features of the pneumatic tire instead of attempting to devise substitutes.

The first great step in reducing the inconvenience incident to a tire failure was the adoption of the double tube tire. When a leak developed a new inner tube was substituted, and after reinflating the tire was as good as new. Plainly this helped matters. But when the novelty of this improvement wore off we were not satisfied with the method of getting at the inner tube to remove it. Then came the detachable form of rim, which we to-day term the quick detachable rim.

With the easy dismounting and opening of the tire it was thought that pretty nearly the last word had been said in the improvement of the pneumatic tire. Not so, at all, for before the quick detachable rim matter had become fairly settled down along came the non-deflatable inner tube, to still further reduce the chances of puncture and loss of air. The Dow inner tube is now well known, and it has the wonderful property of absolutely healing or sealing up any ordinary puncture made by a sharp instrument.

If you don't see what you want, ask for it.

MECHANICAL DRAWING.

A Few Suggestions for Making Sketches in the Repair Shop.

It is not possible to conduct the motor vehicle repair and construction business without doing more or less sketching. New parts are in constant need, and oftentimes these parts must be sketched on paper or sketching board so that the drawings of the same may be sent by mail or express to the concerns who are to make the parts. The drawing to scale is always exceedingly useful to the

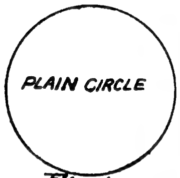


Fig. 1

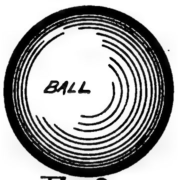


Fig. 2.

machinists who are to turn out the substitute part or who are to make the selection of the same from an assortment of parts. With the drawing of the needed part in hand, the work of securing and fitting that part is made easier. Hence, in the well-fitted motor vehicle repair shop, one may almost always find a corner in which there is a wooden tablet and some drawing devices where one of the ingenious members of the shop keeps his utensils for executing diagrams of whatever may be needed.

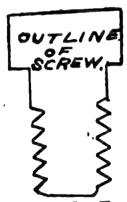


Fig 3

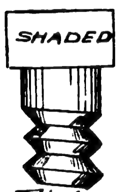


Fig 4

Of course the man who can produce accurate drawings for the use of the artisans is one whose time is valuable, and you do not often find him employed at ordinary work in the repair shop. He can get more pay following his particular line of work in the sketching department of some large manufacturing plant. Nevertheless, there are always men employed at the machines and forges who are capable of making illustrations. A man of this type is usually given charge of the sketching outfit in the repair shop.

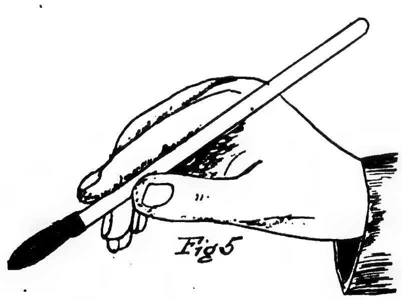


Fig 5

Supposing that a certain size of steel ball is needed. The average man would produce the plain circle shown in Fig. 1 and let it go at that. When the drawings reach the man who is to make the article, he hardly knows whether it is a flat disk or a ball that is required unless there is some descriptive matter on the cut explaining the details. But if he can produce the ball with the rounded off effect as in Fig 2, he can make a good representation. This is done by simply sketching the outer circle with the point of the compass pen. Then as each alternating line is made, the circle is decreased in size a little, until the very center of the space is reached. The circles are increased in distance apart as the middle of the circle is reached.

Then there are the threaded shafts to make with the drawing instruments. Some men produce the sketches for this line of work by making the outline of the saw-like

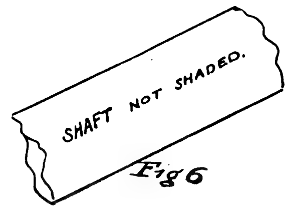


Fig 6

threads as in Fig. 3. The outline is always incomplete and often puzzling to the man who must make the article according to the defining lines of the same on the sketch. Hence if the drawing is made with shaded effects in it, as illustrated in Fig. 4, the parties turning out the threaded shafts or bolts are greatly assisted. The shading of the threads is readily accomplished by applying the series of lines on the same principle employed in the making of the rounding effect in the ball. Some of the illustrators use

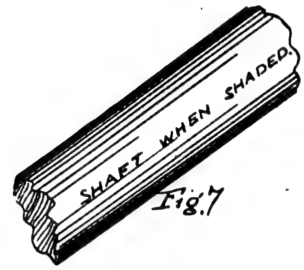


Fig. 7

a camel's hair sketching brush, as shown in Fig. 5. It is possible to get some shading effects with the brush. More surface can be gone over in a given time. The pen requires a stroke for each line. The brush will cover considerable surface at the single movement across the work.

When the piece of shaft which is intended for use in a repair job on a machine is not shaded, as in Fig. 6, the workman is handicapped for the reason that he cannot al-

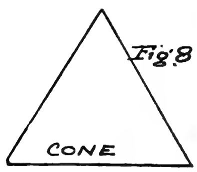


Fig 8

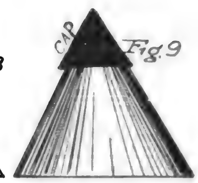


Fig 9

ways determine just what is meant. If the shading lines are drawn into the work, so as to make the effect as illustrated in Fig. 7, the object of the drawing can be determined at once. The shading effect in the line of shafting is acquired by placing a ruler on the cardboard or paper, so as to use this ruler as a guide for the pen point. You can begin at the edges of the work and draw the line close. Then gradually expand the distances between each repeating line until the middle of the work is reached. This is done from either edge of the shaft, resulting in the clear white open space in the middle, which face produces the roundness desired in the combination complete.

Then there are cone specimens which must be drawn and placed on sketching paper in such way that the man who is to make the article can determine what is needed. In Fig. 8 is the outline of the cone, and in Fig. 9 is the same when finished. The shading is done with ease by using a straight edge, following the same plan adopted when making the shading lines for the other objects mentioned.

The workmen are assisted to considerable degree in their work among the motor vehicles when they have at

hand a chart representing in black and white the different metals. For illustration we give a few of the standard specimens in Fig. 10. The babbitt metal is represented on a drawing by series of lines produced across the surface on the order shown in the first drawing of the blocks. Wrought iron is next illustrated and this effect is made by putting series of angular lines across the work, filling

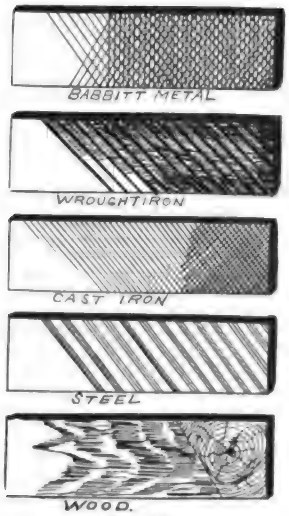


Fig 10

in the spaces between with pen and ink lines. A common representation on drawings of cast iron is next illustrated. The effect is made by drawing in the lines in the two directions, one system of lines crossing the other system, showing the finished effect at the right of the block. Steel is next produced, and this is made in representative sketches by drawing clusters of lines at a diagonal across the face as shown. Finally we have the representation of wood as in the last sample.

Detecting an Ignition Trouble.

Sometimes motors become hot and ignite the charge after the electric switch has been turned off. This can be caused in several ways—poor circulation, too rich a mixture, running on a too-late spark, or by improper timing of the valves. The way to decide which of the four is causing the trouble is to convince yourself it is none of the other three. If your mixture is too rich, it is easily detected by the smell; also by the fact that you get very little power. It is also easy to tell how early the spark should run by advancing it until the engine commences to pound; then you know it is too early, and you should fix the furthest advance spark as far as it will go without pounding, and then control the motors as much as possible with the throttle. Of course, it is impossible to do this at all times, as the amount the spark can be advanced depends upon the rate of speed at which the motor is running and the roads being traversed. If satisfied that both spark and mixture are all right, next look for trouble in the circulation of water. If the radiator is hot, it is some sign that the pump is working, but not sufficient, as the radiator would be hot on a poor circulation and so would the engine. The best way is to disconnect the hose where it attaches to the cylinders, at the highest point, so that no water can run out by gravity. Then start the motor and see if the pump throws a good stream of water. If it does not, one of the three conditions exist—the pump may be out of order, the radiator clogged or the hose so swelled around the connection by hot water and grease that it stops the opening. If the radiator is clogged a 5-cent package of cooking soda put into the water will clear it out. If the hose is swelled, the best remedy is new hose, and if the pump is not working the only thing to do is to fix it. If the trouble is not due to one of the three things, wrong mixture, late spark or poor circulation, it must be in the timing of the valves.

Knocking from Pre-Ignition.

It has already been shown how to correct knocking of the engine when it is due to worn or loose bearings, but premature firing will also cause knocking, and, before concluding that the bearings are at fault, the ignition current should be switched off after the engine has been running a short time, when, if the firing still continues in the cylinder, it may safely be assumed that pre-ignition is the cause of the noise. Even if the engine stops when switched off, the cause of the knocking may still be early firing, as the adjustment of the small controlling rod from the commutator may have been upset in some way. In a case of this sort there is likely to be trouble through back fires when the engine is being started, and, if this occurs when the ignition lever is fully retarded, it is sufficient indication that the ignition control gears want seeing to. In some cases very light, springy rods are used between the commutator and the hand lever, and these may have become bent, thereby altering the time of firing.

In one case the engine could be started without trouble, but after the first few revolutions it fired anyhow and knocked badly, soon coming to a standstill. A casual examination of the commutator and trying the times of firing by turning the starting handle slowly, seemed to show that everything was right, but a more minute investigation revealed the fact that the commutator spindle had broken square across inside the boss which carried the commutator brush, the fracture occurring where the taper pin securing the boss passed through the spindle. Thus, so long as the engine was turned slowly by hand, the friction between the broken ends where the taper pin still remained was sufficient to turn the commutator so as to retain its correct relative position, but the rapid acceleration of the engine overcame the friction, with the result stated.

Little but Important Things.

We often get letters from our readers stating that their car goes well enough on a level, but when they strike a grade or a steep hill it fails to have the necessary power of propulsion. In some instances they tell us that they have examined the compression and find it good in each cylinder, that the ignition is all right, the timing correct, and the valves operate as they should. It ends by their asking us what is the trouble. Of course we have no means of knowing, but if the car were our own we should go carefully over the whole motor. Possibly the result may be that the trouble is not due to any one single thing but to several. One or more spark plugs may be dirty or have spark gaps too large, the electrical connections are somewhat loose and dirty, there is a slight short circuit somewhere, there is deposit in the carburetter, or the filters at the bottom of the tank or in the union close to the feed chamber are more or less choked; an exhaust spring is weak and its valve does not close as readily as it should; the holes in the muffler are choked with mud or grease and there is some back-pressure caused thereby; one of the brakes is rubbing more or less on its drum, a tire is soft, the accumulators are down a bit, or there is a considerable deposit of carbon on the combustion chamber walls and piston heads. These small matters taken separately do not appear to be particularly serious, and should not of themselves detract in any marked degree from the pulling power of the engine. Suppose, however, that each of these little failings reduces the horse power

by one-tenth. Their sum total of reduction is enough, and more than enough, to deprive the engine of the strength which it is designed to have. This sluggishness is generally found a characteristic of careless drivers; those who desire to get the most out of their engines and cars, under the best conditions, should give all the little points constant attention.

Correct Wiring Methods.

Car drivers cannot become too familiar with wiring the electrical circuit of the coil, battery and spark plug. In Fig. 1 is shown an incorrect method even now sometimes used, and in Fig. 2 a far better and more correct way. In Fig. 1 it will be observed that the high tension current which jumps across the points of the spark plug must

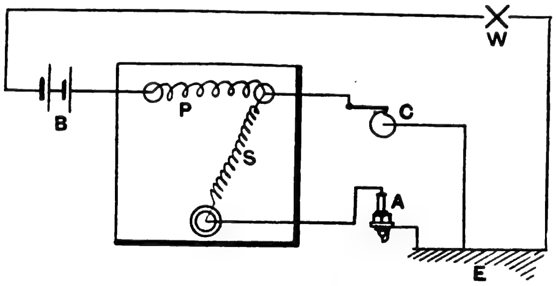


Fig. 1.—The following reference letters also apply to fig. 2.
A, sparking plug
B battery
C, contact breaker
E. earth
P, primary circuit
S, secondary circuit
W. switch

complete its circuit either across the mechanical contact or through the primary coil, battery and switch.

When a non-vibrator coil is used, the high tension current does not take place until the primary current is broken at the mechanical contact. Of the two paths open to the high tension current the one through the primary coil possesses such high induction that it prefers the path through the contact breaker. Although this path is now broken by the engine having opened the contact, thereby increasing considerably the resistance of the circuit, there is practically no additional induction. The current, therefore, passes in the form of a spark at the contact breaker, and will in time burn away the platinum, in addition to giving a very much less effective spark at the spark-plug. There is no doubt that the marked preference for vibrator coils and wipe contacts is due to this wrong method of

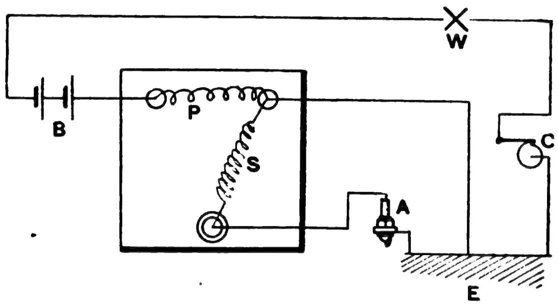


Fig. 2.—Index is beneath fig. 1

connection. With the vibrator coil and wipe contact the larger metal connection allows several of the high voltage currents to pass through the contact before it is broken. In fact, the charge is fired before the mechanical contact breaks the circuit. The effect of the wrong method of connection is thus reduced but not entirely removed, and may make itself felt at high speeds.

The obvious remedy is to make the high tension circuit as short as possible, and quite independent of the primary circuit as regards completeness. This, of course, done, there would be less chance of error if all coil makers had kept the two circuits distinct by providing four terminals instead of three.

Figure 2 shows the correct method, and applies equally to vibrator and non-vibrator coils.

It will be seen that the high tension current has a path of its own, that is not affected in any way by the working of the engine, and it desires no path through the engine contact. Certainly a portion of the path is common to both currents, but no interference takes place.

THE COOLING SYSTEM.

Functions of the Water Jacket and the Radiator and Their Care.

The water cooled system of cylinder cooling should be so well understood that the driver need never get puzzled if it does not work quite right. Tremendous heat is generated by the continued explosions of fuel while the engine of an automobile is running, and in order to prevent the cylinders from becoming red hot it becomes necessary to introduce some means of reducing their temperature.

The most common method of accomplishing this is through the installation of a cold water receptacle and a radiator. This receptacle is so constructed that it surrounds the cylinder, the water coming in direct contact with the walls of the cylinder. It will be readily seen that unless some means be devised for reducing the temperature of the water it too would soon reach the boiling point and would then have little or no beneficial effect upon the cylinder.

The radiator here finds its mission, and while it does not keep the water cold, it does nevertheless prevent it from becoming too hot. The system is so arranged that the water is drawn from the lower part of the radiator by means of a pump, driven by the car's own engine, and forced up through the water receptacle, technically known as a "water jacket," and thence back to the radiator. The result is that the radiator cools the water, while the latter cools the cylinder walls.

There is still another consideration in connection with this system of cooling, however, which must not be overlooked. When the engine is at a standstill the water pump is, of course, at a standstill, and will quickly cool of its own volition, inasmuch as but a small part of it is now coming in contact with the cylinder. In warm weather this does not matter, but in the winter season the water is quite likely to freeze up and burst something. As a preventive of trouble from this source it will be advisable to add an anti-freezing solution of some sort to the water used in the cooling system.

In the event of an examination of the water jacket becoming necessary it will be found an easy task to remove the priming cock from the top of the cylinder. After this has been done the water connections should be unscrewed and the nuts which hold down the water jacket plates taken off. Next a chisel or some other instrument may be inserted between the plate and cylinder casting and the plate lifted from its seat. The water jacket will now be fully exposed to view and any foreign substance which may have found its way into the water may easily be removed.

There are countless rules for the care and operation of an automobile, but it is usually the case that the successful motorist is the man who, after fixing in his mind the theories which have been advanced in a good book of instruction observes causes and effects while operating his car. Strange as it may seem, however, there are many chauffeurs operating machines to-day who possess a knowledge of the automobile which carries them little beyond the point of starting and stopping the car, and it sometimes

happens that they are not even put to the trouble of performing the latter duty for the reason that the car rebels against its unseemly treatment and stops of its own accord.

FOR SPRUNG LIVE AXLES.

Remedy for Saving Them from Further Distortion.

The following tip will be of interest to many who own live axle cars which have been in use for a year or two. Quite a number of such cars have had their axles spring downward in the center, as may be observed by standing a little distance in rear of them when the inclination of the wheels from the vertical is very apparent. This spring is in some cases due to the back axle casing being too light in construction or insufficiently stayed, but in the majority is caused by overloading or overdriving. If there are any who wish to save their axles from further distortion here is a remedy.

The following method was suggested by the foreman of a local garage: Most axles are trussed by a stay rod passing under the differential case. If this stay is tightened up to bring the axle back to shape when it has got out of truth it generally breaks, and in such cases it is often impossible to fit a stronger stay, as the lugs will not stand the holes in them being enlarged, and there is not room for the larger stay rod nuts to turn round. In place of a *single* stay rod *two* can be fitted, and if a larger size is desired, by fitting plates as shown in Fig. 1, which is an elevation of part of a back axle, and of a thickness suitable to the strength of stays to be fitted. These plates should be bolted to the existing lugs as shown in Fig. 2, which is a section through the axle looking towards the road wheel (not shown). It is very important that each plate be fitted on the side of lug *nearest the road wheel,* or the bolt securing plate will be in *tension,* and just as liable to break as the single stay rod which is to be replaced. A little filing of the axle may be required, and the shape of the plate may have to be varied to suit axles of different design. Fig. 3 (a side elevation of differential casing) shows a means of securing the stay rods where they pass under the differential casing. The plate shown on Fig. 3 may also have to be adapted in shape to suit the back axle it is intended for.

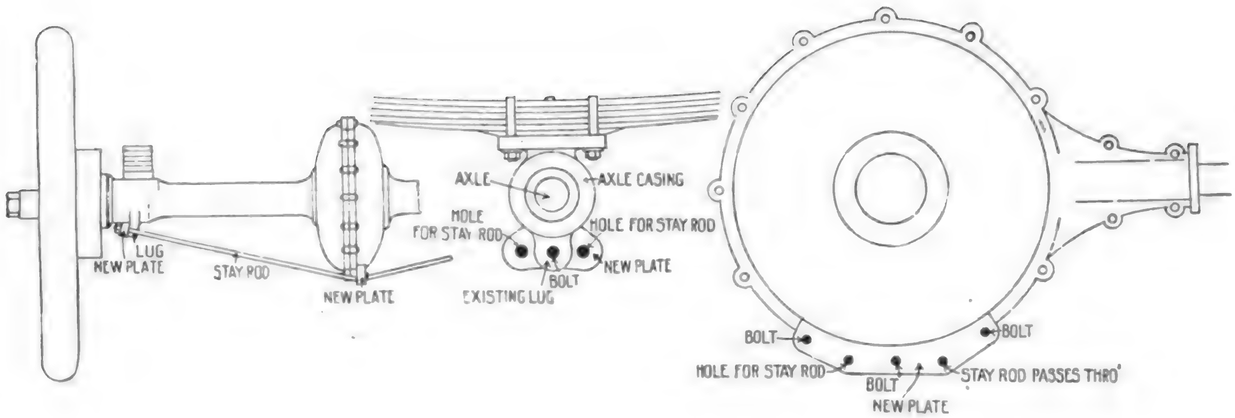


Fig. 1. Fig. 2. Fig. 3.

If a Piston Sticks.

If the engine refuses to move or is very difficult to pull around for starting, one or more pistons may have stuck, owing to failure of lubrication. A little kerosene injected into the cylinder may remedy the trouble.

Pinching of Inner Tubes.

Inner tubes are often pinched and torn when the tire is mounted, and generally occasioned when the automobilist is trying to place the second cushion inside the rim. The air chamber gets pinched to a more or less considerable length, and determines a corresponding cut, which it is almost always impossible to repair on the road. Then the tube is forwarded to the factory, where a "muff," of a length equal to the wounded part, is fitted. While the pinch is considered as an onerous accident, there is nothing easier than to avoid it.

There are three sorts of pinches. The first is formed between the shoe cushion and the bottom of the rim. It occurs generally when the operator puts into place the last part of the cushion, and the tube is not sufficiently inflated. The second sort of pinch is formed by the introduction of a part of the air chamber under the head of one—or several—of the safety bolts. The third, which is less frequent, consists of a fold formed by the air chamber near the valve, and maintained in this position by the valve itself.

Adjustment of Ball Bearings.

Do not forget that a bearing which seems to be properly adjusted before the locknut is tightened will be too tight after. The reason is that the locknut takes up by its pressure whatever looseness there may be in the threads of the first nut, crowding it against the ball cone. To adjust properly the nut should be screwed up until no slack can be felt in the bearing, but still not enough to make the bearing tight. It should then be backed off slightly, the lock washer put in place, and the locknut carefully tightened. The wheel must then be tried again, and unless a slight but perceptible shake can be detected the locknut must be unscrewed and the first nut backed off a little more.

Tire Rim Cutting.

Rim cutting would seldom be seen were rims perfect and tires properly inflated. Sand blisters and loose treads are caused by small cuts in the cover which allow dirt and moisture to penetrate to the fabric. Unless removed and the cuts cemented this dirt becomes powdered, and as the friction stock is softer than the thread stock the dirt follows the line of least resistance and is slowly pushed between these layers, causing their separation. Most tire manufacturers use four sizes of lugs; a four-inch tire takes a "C" lug, and a four and a half-inch tire a "D" lug. It is not infrequent to see them changed about, neither lug can properly seat itself and will surely be a cause of trouble.

TROUBLE DEPARTMENT.

Under this head are questions and when possible, replies to them. Our readers will appreciate the importance to inquirers of furnishing the desired information promptly.

This department is intended to be a "trouble clearing house," and it will be esteemed a favor if our readers will add information to it from their own experience or knowledge.

An Error in Calculation.

From E. M. Estabrook, Maine.—In your February number there is an interesting article on power transmission, by James F. Hobart, in which a slight error in calculation occurs.

With an engine running at 350 revolutions per minute, he figures that it requires a 60-tooth sprocket on the motor shaft and a 13-tooth sprocket on the axle of the wheel to speed the car with 26-inch wheels 40 miles per hour. Any one reading the article with enough care and attention to absorb its meaning would know at once that this was an error pure and simple, which should have been discovered in rereading it or in the editorial department. The gear necessary to accomplish this would be 31 to 21, or any lesser number giving a gear ratio of 3 to 2, and not approximately 5 to 1.

Why I mention this at all is simply to illustrate the fact that automobilists are getting to be very critical readers and are really studying the various articles appearing in the papers with a view to absorbing all the practical knowledge they contain.

Of course there are many articles read and perhaps reread, similar to the one we are discussing, without noticing the errors they frequently contain; and of such we may say they do not give the information they should. Many purely technical errors, such as a slip of the tongue or pen, go unchallenged, but misleading statements should be corrected with a view to their elimination altogether.

I notice that all of the automobile papers and many of their correspondents are each week having some of their statements or articles criticized; and it makes very instructive and entertaining reading. While it may deter some from expressing their ideas in public print, it certainly has a tendency to make those more careful that do so.

I have been living in hopes that some one would make a "crack" in the DEALER AND REPAIRER similar to that made by Mr. Stearns regarding the efficiency of fours as against sixes, etc., in which he let loose the dogs of war against himself. These discussions are very interesting, inasmuch as they open up a wide range of criticism from all standpoints.

If a man knew just what he was "up against," he must have the courage of his convictions and would naturally be very careful in the choice of his statements, or be literally "picked to pieces."

Tire Protectors.

From J. H., Iowa.—I would like to have your opinion of the automobile tire protectors for protection. We have very rough roads in our country, and in this case will it pay to buy them? Some say they are a good thing and some say they are not, but that they rot out the tires.

Reply.—Tire protectors do not rot the tires to any appreciable extent and they save wear and reduce the liability of blow-outs and punctures. On the other hand, they slightly reduce the comfort of riding and add something to the cost of propulsion, although this may not be appreciable. But there are many kinds of tires and about as many kinds of protectors. Some tires need protectors more than others, and some protectors save tires more than others. It will probably pay you to use tire protectors.

Current and Coils.

From E. F. Bacheller, Massachusetts.—In the March number William Schultz, Nebraska, asks about cause of the large consumption of current in the Ford car. I have tested a number of the coils on these Ford cars and find that very few can be set to take a small amount of current, and when first tested generally are using all the way from 1 to 4 amperes, this can generally be reduced to between 1 and 2 amperes if adjusted with a meter in circuit.

My experience with the Splitdorf coil is that a multi-cylinder coil of that make is very hard to adjust to an equal current consumption for all the coils unless they are all set high. If your subscriber will clean the coil contacts and re-set with a meter, or, if he has no meter, back the screws off and then screw down gradually until the engine will run, he will get the least current consumption possible with that coil. My experience with the Apple outfit is O. K.

About Skipping.

From J. E. B., Maine.—Some time ago I had the trouble of "skipping" when my spark was advanced to the proper running point—that is, when the motor developed the most power. My repair man insisted that it was the carburetter, but a change of adjustment and finally a change of carburetters did no good. Retard the spark and there was no skip, but raise it to the proper position and the skip would occur. Finally a minute inspection revealed the fact that one of the wires running to the commutator was nearly broken off inside the copper terminal, thus making it hard to discover as well as very mystifying. I hope this may help some one in the same fix. It certainly led me a pretty song and dance in G minor.

Simple Method to Estimate Power.

From C. W. B., Wisconsin.—Please tell me of some simple way of figuring to get the power of a gasoline motor?

Reply.—A simple method used by many mechanics is to square the bore of the cylinder and divide by 2½. Then multiply by the number of cylinders and the result is the horse power of the motor.

Care of Chains.

When a chain has been run from 2,000 to 3,000 miles it should be taken off and cleaned by immersing first in hot water and then in gasoline. Afterward it should be boiled in mutton tallow for at least half an hour. This gets the grease into a fluid state so that it will enter between the roller and contact surfaces of the pins and links, and when cold it will exclude all dust or grit from entering therein, besides it forms an excellent lubricant between the rolling surfaces.

Increasing the Exhaust Opening.

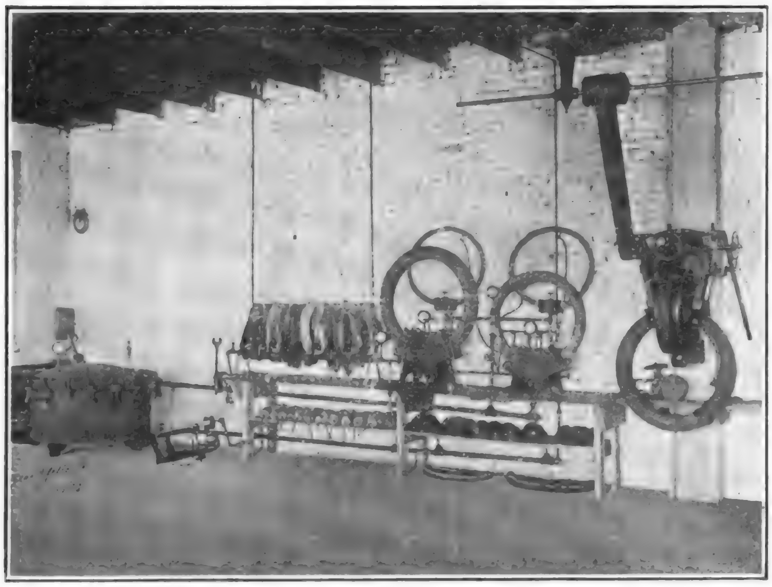
By unscrewing the valve which is provided in the front end of the muffler on some cars the exhaust opening will be increased. This will have a tendency to decrease the back pressure and reduce the heat, as well as very frequently increasing the speed of the car to a considerable extent. This expedient, however, is one that should only be resorted to for long journeys and the valve should be closed again before driving through crowded streets.

MILLER'S VULCANIZERS AND RUBBER MACHINERY.

The illustration represents vulcanizers and rubber machinery manufactured by Charles E. Miller, Anderson, Ind., for the repairing and recovering of automobile tires and tubes. The adjustable sectional vulcanizers are made in two sizes, No. 1 repairing all sizes and makes of tires from 2½ to 4 inches. No. 2 repairs all sizes and makes of tires from 4 to 5½ inches. However, either vulcanizer will repair 4-inch tires. This same style vulcanizer is made for motor cycle and pneumatic carriage tires, also for bicycle tires, each vulcanizer is furnished with the necessary bead strips, to repair Fisk, Dunlop, G. & J. and single tubes without extra charge.

The large kettle vulcanizer, which he manufactures, has a capacity of five to six tires at one time up to 40 inches, has a counter balance lid which can easily be lifted with one hand, doing away with special apparatus for handling lids such as chain blocks and pullies, which adds considerably to the cost before the vulcanizer is ready to use.

The power wrapping machine, which is also illustrated in this cut, wraps tires automatically by machinery. The tire is placed in this machine and wrapped much tighter and evener than it can be wrapped by hand in about five minutes' time. It takes all sizes of tires.



Vulvanizers and Rubber Tire Machinery.

The inner tube vulcanizer, which is also shown on this cut, is 4 inches wide and 58 inches long, has a hole drilled through it for vulcanizing on valve stems, and will vulcanize twelve to fifteen tubes at one time. Readers should write to Charles E. Miller, Anderson, Ind., for full particulars concerning these and many other devices for rubber tireing and rubber tire repair. His line is a complete one. In writing him, mention The Automobile Dealer and Repairer.

STRAIN YOUR GASOLINE.

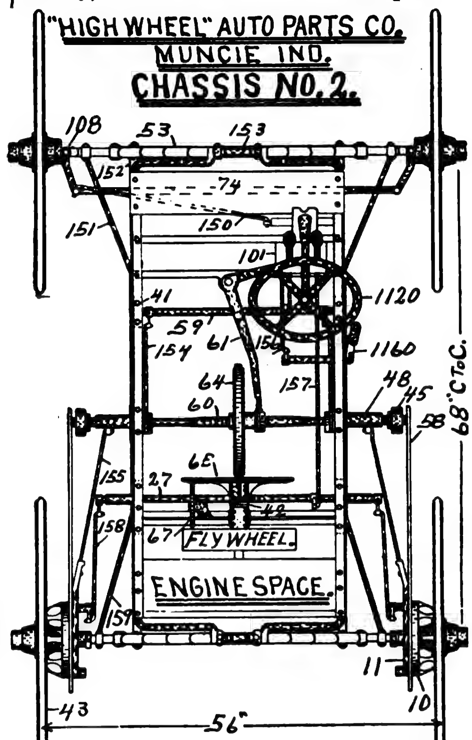
In this connection we illustrate a device manufactured by the Hatcher Auto Parts Company, 195 Viaduct, Cleveland, Ohio, for straining gasoline. Even though the highest grade of gasoline be used in a motor, it is impossible to get fuel that is perfectly free from foreign substances when entering the carburetter. This strainer removes any foreign substance which may be in the gasoline and eliminates most of the carburetter troubles, the manufacturers contend. Water and any foreign substance in the gasoline will clog the carburetter and lead pipes, and finally will interfere with the operation of the motor, causing the usual inconveniences of making tests of batteries, etc., in an endeavor to locate the particular cause of the difficulty. The strainer referred to weighs but seven ounces and can be placed in any gasoline car or motor boat without difficulty. Those of our readers who may be interested should write to the manufacturers as above for further particulars, or send an order.

A Gasoline Strainer.

Automobile Insurance.—In this issue will be found the announcement of Fred C. Smith, 43 Cedar street, New York, insurance broker, who makes a specialty of insuring automobiles against fire or accident. He can place you in reliable companies at the lowest rates. Write to him for further particulars, mentioning The Automobile Dealer and Repairer.

HOW ANY ONE MAY BUILD AN AUTOMOBILE.

Perhaps the most remarkable business in this country is that of the High Wheel Auto Parts Company, of Muncie, Ind. They are prepared to furnish all the mechanical parts necessary for building a fine type of the high-wheel; or "buggabout" style of automobile. By purchasing these parts, the garage owner, dealer, repairman, or even the individual who wants an automobile for his own use, can build a high-wheel auto, easily, quickly and with ridiculously small expense. The mechanical experts of this company, after years of study, have devised a line of auto parts, simple, durable and effective, and which represent the most advanced ideas in this line of work. We show cut of their Chassis No. 2, an especially popular pattern. The cut shows a friction gear, but the chassis can be furnished with planetary gear, if desired. Any of the parts will also be furnished separately, if desired. See announcement this month on our outside back cover. As this advertisement is only ordered to appear once in our columns, readers are urged to write at once, before they forget it, for the catalogue of this company, which will be found to be an exceedingly interesting document. Address the High-Wheel Auto Parts Company, Muncie, Ind., and mention The Automobile Dealer and Repairer.



Two Live Ones.—In this issue will be found the announcement of the General Accumulator and Battery Company, 122 Second street, Milwaukee, Wis., directing attention to their "Center Fire" plugs, which increase power 10 per cent., they say, and also their Decarbonizer for removing carbon from all parts of gas and gasoline engines without injury. But consult their announcement, and in writing to them mention The Automobile Dealer and Repairer.

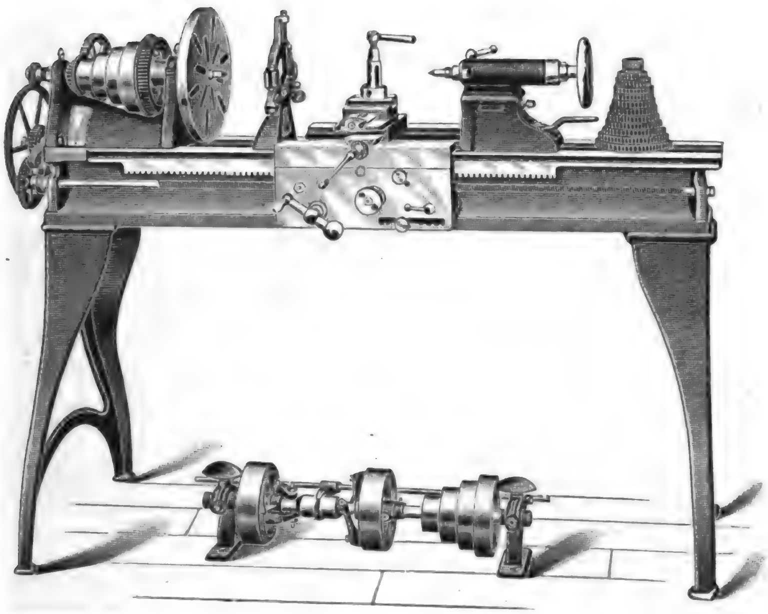
A FINE SCREW CUTTING ENGINE LATHE.

This lathe has a splined screw, giving rod feed for turning, reserving the screw for thread cutting only; also it has automatic cross-feed and compound rest. With the patent velocipede foot power, motion can be started, stopped or reversed instantly, at the will of the operator, and greater power can be applied on the work than with any old-style foot power, and with greater ease. The head stock has a hollow steel spindle that will take a half-inch rod through its entire length. The boxes are accurately fitted to the spindle, with provision to keep them true and take up wear. The tail stock can be readily set at any desired point, or taken altogether from the lathe bed, without removing nuts or bolts. It can also be set over for turning tapers. The spindles for both head and tail stocks are of steel, with positively true taper holes for the reception of the centers, and the tail stock center is self-discharging. The tool carriage is a model of convenience and accuracy, and is gibbed to the bed.

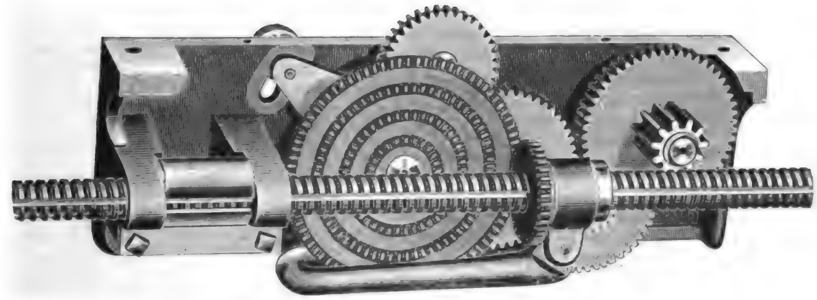
All the works are securely protected from chips and dirt, thus insuring long wear and durability to the most costly and vital parts of the lathe. It is indexed for threads 4 to 32, and the change gears furnished can be combined for many other threads.

Special attention is directed to the feed arrangements in this lathe. In the full view of the lathe at the lower right hand corner of the tool carriage apron, is a slot; in this slot is a lever which is also shown in the rear view of the apron. This lever, moved to the right or left, gives a great range of feed, graduating instantly from coarse to fine or vice versa. With this lever the feed can be instantly reversed. It also serves the cross feed of the tool carriage in the same manner.

For further information, address the manufacturers, W. F. & John Barnes Co., Rockford, Ill.



Screw Cutting Engine Lathe No. 13.



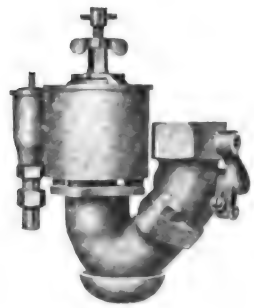
Patented Fred Arrangement in Tool Carriage.

CEMENT THAT IS CEMENT.

Many repair men, in doing tire work, have great trouble in getting a cement that will give entire satisfaction; but, according to the testimony of thousands of satisfied users F. B. Parks' Rubber Cement has no fault whatever. It contains no acids to corrode the rubber and it invariably outlasts the rubber. The hottest day in summer does not phase the patch or plug put on with Parks' Cement, and the racing car has yet to be made that goes fast enough to affect it. This cement has been in constant use all over the country for four years, and the demand for it has steadily increased. The manufacturers are anxious to have our readers try this cement, hence their special offer to send a sample can to you postpaid for 50 cents, if you will mention The Automobile Dealer and Repairer. This offer may be made but once in our columns. Write now for sample or for free circular and mention this magazine.

The Palmbla Syphon Carburetor.—The new 1908 model Palmbla Syphon Carburetor, made by the North Chicago Machine Co., of North Chicago, Ill., embodies some of the principles of their 1907 model, but is entirely new in its style and method of operation. The syphon method employed, while old in other lines, is new in carburetor work, and will appeal immediately to mechanical engineers and carburetor experts when once explained. In its operation it has no moving parts or valves, has but one air intake, and only one adjustment (gasoline). Under all conditions it will give a uniform mixture at speeds from 300 to 2,500 R. P. M.

Mr. Palmbla has been experimenting on carburetors embodying the principles in his latest inventions for the last two years, but heretofore has been unable to get the efficiency or flexibility for perfect carburetion, but says his new 1908 model is almost perfect, both in theory and practice.



Carburetor manufactured by the North Chicago Machine Co., Chicago, Ill.

In a series of tests conducted with various motors, all running at speeds from 400 to 2,500 R. P. M., a constant blue flame was emitted from the exhaust at all times. This proves the gasoline feed was fixed and at exact proportion to the air passing through the carburetor. Broad and basic patents have been allowed on the essential points, and new patents are pending on the 1908 improvements. Foreign applications have been filed.

Friction Drive.—In this issue the Motorcar Company, Detroit, Mich., have a new announcement which will interest some of our readers no doubt. It relates to the special merits of the friction drive of the "Cartercar," which they say makes it the most perfect operating of any car built. There is no clutch to slip, no gears to strip, no grease, no noise. Write to them, mentioning the Automobile Dealer and Repairer, and they will send you a booklet which tells all about it.

Good Tops Made Right and Quickly.—The Auto Top Company, 209 East Columbia street, Fort Wayne, Ind., solicit your orders for auto tops of every description. Be sure to get their prices before buying. They make a specialty of filling orders in a hurry, if haste is required, and their tops are always neat, durable and well-fitting. In writing them mention this magazine.

State and City Laws.

In People-Hainer v. Keeper of the Prison of the Seventh District, New York City (New York Court of Appeals), the accused was held to bail for trial in the Court of Special Sessions under the motor vehicle law for driving his machine at a greater speed than one mile in six minutes. He claimed that he should have been prosecuted under the city ordinance prescribing a speed of eight miles an hour, and which provided a lighter punishment, and that this superseded the State law, and, therefore, that he was wrongfully held. It was not shown that the State law requiring signs to be erected under the city ordinance had been carried out. It was also held that the city ordinance prescribing a speed slower than that prescribed by the statute only applied to cases where the prosecution was for the slower speed, and in such a case a person should not be subject to the statutory penalty. The prosecution under the State law was affirmed.

Since one's safety, and perhaps one's life, may depend upon the efficiency of the brakes, these should come in for a most thorough examination. Jack the rear wheels up with the engine running and let in the clutch on the low speed. Both the hand and foot brakes should independently be able to pull the engine up. Note whether the two side brakes are applied evenly. Brakes can only be tested adequately on the road.

"TRIUMPH" AUTO GREASE.

There has seldom been a greater sensation in the auto trade than that caused by the introduction of "Triumph" Grease. Few have ever tried this wonderful red grease (you can recognize it by its bright red color) without praising it enthusiastically; and it is not too much to say that this grease is, indeed, hard to beat as a reliable all-around auto lubricant. This grease is guaranteed to give satisfaction. It does not require friction to warm it up and make it effective. On the contrary, it begins work the moment the gears or bearings start, and keeps right at it until they stop. It greases every crack and cranny of the gear-case, wherever it is put. The hottest weather will not melt it, and it lubricates effectively in the coldest days, even if 20 or 30 degrees below zero. The manufacturers of the "Triumph" Grease would like to sell you a sample can, but if you do not want to risk any money, they are willing to send you a sample of the grease, free of cost. All you have to do is to cut the "free sample coupon" out of their ad., which appears on our back cover this month, give your name and address, and state whether you are a dealer, garage owner, repair man or auto owner, also mention THE AUTOMOBILE DEALER AND REPAIRER. If you do not want to buy a sample can and will not even accept a free sample, you can at least write for information which will be cheerfully and promptly furnished. Write now to the Perfection Grease Company, South Bend, Ind., and mention this magazine.

WANT ADVERTISEMENTS.

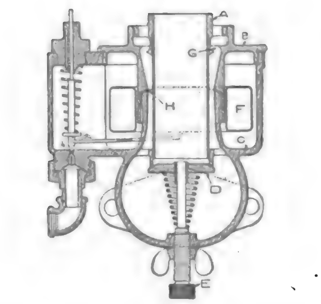
Under this head will be printed advertisements of shops for sale or to rent, or shops wanted, or situations or help wanted, or tools or machines (second-hand) wanted or to exchange, at the uniform price of two cents a word, which will include the address, for each insertion, payable in advance. No advertisement will be inserted for less than 30 cents, however small.

Remittances can be made in postage stamps if more convenient. Address,

MOTOR VEHICLE PUBLISHING CO.,
24 MURRAY STREET, NEW YORK.

THE BROCK CARBURETOR.

This carburetor, herewith illustrated, is made on an entirely new principle. A thin vapor of rarified gasoline, supplied by the annular valve, completely surrounds a thin sheet or hollow column of incoming air, making a uniform, rich mixture, without the lean streaks or stratified condition. As the throttle is opened a separate column of air is drawn through the center of the hollow annular column of mixture and spread out in a sheet at the point of intersection by the compensating air valve. All other carburetors have needle-point feed, or what is closely allied to needle-point or nozzle. An engine running at high speed takes the mixture and explodes it so rapidly that it will need no argument to convince even one who is not an expert that the mixing must be done at a rapid pace. This carburetor was recently tested with about a dozen other standard makes and the Brock showed a higher horsepower than any.



A—Stand pipe through which the incoming air reaches compensating air valve; also acts as adjustable choker for initial air at opening, G.
B—Cover for float chamber; also acts as adjustable annular gasoline valve in connection with C.
C—The float chamber, mixing chamber and annular gasoline valve.
D—Compensating air valve.
E—Compensating air valve adjustment.
F—Annular float.
G—Initial air inlet.
H—Annular gasoline valve.

The Brock Carburetor is extremely simple, having fewer parts than any other make. For full explanation of the accompanying sectional diagram and for any other information write to A. A. Brock, 86 La Salle street, Chicago, Ill., and mention THE AUTOMOBILE DEALER AND REPAIRER.

A NEW CAR MODEL.

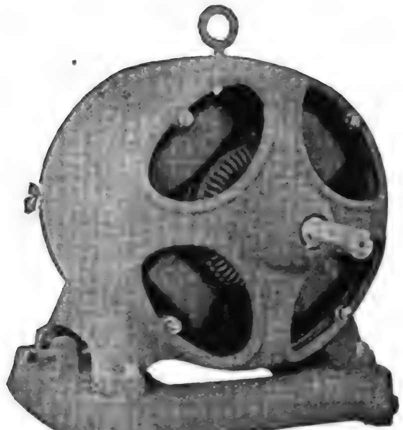
Max Grabowsky has severed his connections as manager and designer for the Rapid Motor Vehicle Company, of Pontiac, Mich., to accept the active management of the Grabowsky Power Wagon Company, of Detroit, Mich. Mr. Grabowsky's object in leaving the Rapid Motor Vehicle Company was to form a new company to manufacture his latest designs in commercial cars. He has made an exhaustive study of self-propelled vehicles, and is recognized as a high authority in the art of power wagon construction, appliance and equipping.

The new model wil be out about May 10, and the public is promised some startling innovations, both in designs and construction.

A good stiff tool of ample size for automobile repair work. Satisfied users all over the country prove our best selling agents. Send for catalogue and prices.

Rockford Drilling Machine Co.
Rockford, Ill. U. S. A.

"C" Type Motor



Dynamos and Motors Rebuilt.
Spare Armatures. Armatures Rewound.
Commutators Refilled. Brass Bushings. New Shafts.
Field Coils and Armature Coils Supplied on Short Notice.

Correspondence invited.

The Holt Electric Company

Manufacturers of

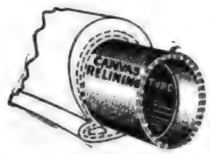
DYNAMOS AND MOTORS,

285 Virginia Street - - Milwaukee, Wis.

WE CAN MAKE YOUR TIRES LAST TWICE AS LONG.

It's the canvas of a tire—which GIVES out BEFORE THE RUBBER IS HALF WORN OUT. We RENEW the entire canvas, shipping it to you fully stretched, formed and ready to insert.

Easily Applied. Inexpensive.



Endorsed by Leading Garages and Owners.

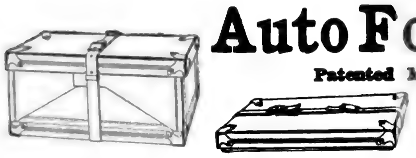
DON'T WAIT until the tire is all shot to pieces (although we frequently give discarded tires an extra season's use) but PREVENT BLOW OUTS and RIM CUTS by relining ANY TIRE NOW, if it has had from 4 to 6 months' ordinary use. Every owner and every garage man that is not posted, should write at once for our booklet.
Mention the Automobile Dealer and Repairer.

INNER SHOE TIRE CO., Grand Rapids, Mich.

AUTOMOBILE INSURANCE

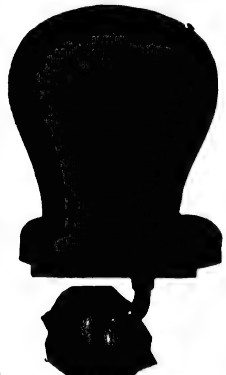
Every man should have his automobile insured against fire or accident. I can place you in **reliable companies** at the **lowest rates.** Address for particulars Fred C. Smith, Insurance Broker, 43 Cedar st., N.Y.

Auto Folding Lunch Box



Patented March, 1906. Trade-Mark Registered.
No Auto is complete unless equipped with an **Auto** Folding Lunch Box.
Large size, 6½x8x12..........$1.50
Small size, 5x5x8.............. 50c.
Mailed upon receipt of price.
ATLAS MFG. CO. - - HAMPTON, N. H.

AUXILIARY REVOLVING CHAIR SEATS.



Pat. Apl'd For.

Now is the time to place your order for a pair of the G. & C. AUXILIARY SEATS, hand-forged, made for service and with an enviable reputation. Easily attached in Tonneau or Motor Boat. Made to fold up when not in use, and revolve to side of car. Sold in the white, or upholstered with any material desired. Write for prices. HEADQUARTERS for HIGH GRADE AUTO BODIES of every description.

TAXIMETER CABS & LIMOUSINES SPECIALTIES.

We solicit your patronage.

GRAVES & CONGDON CO., Amesbury, Mass.

Auto Directories Co., Inc.

CERTIFIED COPIES OF THE OFFICIAL LIST OF AUTO OWNERS, CHAUFFEURS, DEALERS, GARAGES, MANUFACTURERS AND JOBBERS IN THE U. S. AND CANADA. ALSO MOTOR BOAT OWNERS.

Offices, 1717 Broadway

NEW YORK CITY

'Phone 858 Columbus.

SPECIAL REQUEST

¶ IN writing to advertisers for circulars or information, you are earnestly requested to mention in each case that the advertisement was seen in the "Automobile Dealer and Repairer." By so doing you will confer a favor on both publisher and advertiser. : : : : :

Classified Buyers' Guide.

Index to Advertisers.

WORTH THEIR WEIGHT IN GOLD TO ANY CAR

Over 10,000 Cars Equipped

The Greatest Device in the World for Saving Your Car

Send for "MISSOURI PROOF"—we show you—and our 1908 BOOKLET—it's interesting.

Beware of worthless makeshift single or double coil imitations and infringements.

Liberal NO RISK propositions to the trade.

WHAT OTHERS SAY:

"100,000 miles and not a broken side spring."
C. W. NUGENT, St. Louis.

"Am thoroughly satisfied with them."
E. W. GIBSON, The Point, Tasmania.

"They ride extremely nice."
BRITISH-AMERICAN CO., Coventry, England.

"They are everything you claim for them."
Dr. F. E. BUCK, Jacksonville, Fla.

"I cannot understand how I did without them."
LEOPOLD KAHN, New York City.

"Make the car ride very comfortably."
S. N. BRIGGS, Los Angeles, Cal.

"I cannot praise them enough."—H. L. TURNER, Boston.

The above extracts from a select few letters recently received give an idea of the range of territory in which the Supplementary Spiral Springs are popular. We have too many to print.

SUPPLEMENTARY SPIRAL SPRING CO., Inc. Main Office, 4522 Delmar Ave., ST. LOUIS, MO.

Branches: NEW YORK, 52 W. 67th. BOSTON, 889 Boylston CHICAGO, 1712 Michigan. PACIFIC COAST, Los Angeles.

A Sticking Success

Can use it on the road or at home.

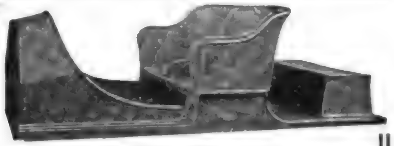
Try C. O. T. Gum Gum to fill up the digouts in the rubber of your outer casing.

Four Ounce Tube Fifty Cents.

CHAS. O. TINGLEY & CO.,
Rahway, N. J.

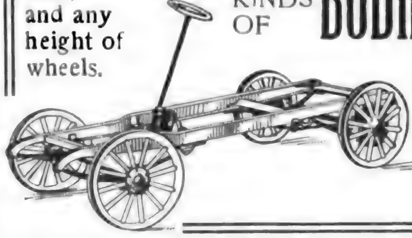
Established 1896.

AUTOMOBILE



Running Gears, with pressed steel or angle iron frames, also chain or shaft drive. Any wheel base up to 120 inch, and any height of wheels.

ALSO ALL KINDS OF **BODIES**



Wheels, Axles, Steering Devices, Springs, Etc.

WRITE FOR OUR NEW CATALOG AT ONCE.

BORBEIN AUTO CO.,
2109 & 2111 N. 9th ST.,
ST. LOUIS, MO.

SPECIAL REQUEST

¶ IN writing to advertisers for circulars or information, you are earnestly requested to mention in each case that the advertisement was seen in the "Automobile Dealer and Repairer." By so doing you will confer a favor on both publisher and advertiser. : : : : :

THE WONDERFUL AUTO LUBRICANT

This is that "Red Grease" they are all talking about.
GENEROUS FREE SAMPLE
If you mention this journal. Write NOW for particulars.

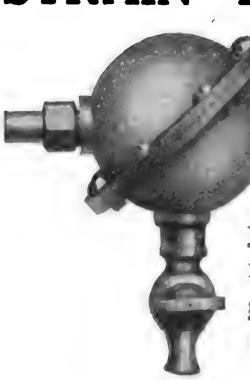
PERFECTION GREASE CO.,
SOUTH BEND, IND.

EXCELSIOR SUPPLY CO., Chicago, Ill.
Western Agents.

R. E. P. SPORTING GOODS CO., Brooklyn, N.Y.
Agents for N. Y., N. J. & Middle States.

T. F. RUSSELL & CO., Boston, Mass.
New England Agents.

STRAIN YOUR GASOLINE



and avoid Carburetor troubles.

A little water or foreign substance in the gasoline will put your Carburetor out of commission. Our STRAINER is guaranteed. **Price, $2.00.**

Write at once for catalogue. Special prices to dealers Address

HATCHER AUTO PARTS CO.,
195 Viaduct, Cleveland, O.

DON'T LET 'EM FOOL YOU!

IF YOU PAY ANY MORE THAN

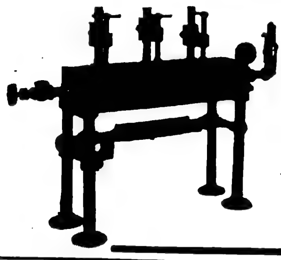
20 CENTS PER GALLON

FOR

METAL POLISH YOU ARE BUYING **HOT AIR**

WRITE TO US ABOUT IT.

ROBERTSON & COMPANY,
324 W. MADISON STREET, CHICAGO, ILL.



The "Boilerless" Steam Vulcanizer

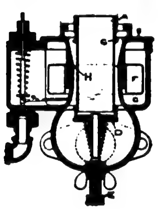
NEWEST RELATIVE OF THE "EXCELSIOR."

Underneath the square semi-steel body is fitted our special gas burner, thus doing entirely away with boiler for inner tube work.

Furnished complete with steam gauge, safety valve, filling valve, air cock, and our well-known quick-acting clamps. LOW COST. HIGH SATISFACTION. Immediate Shipment.

WISHART-BURGE MACHINE WORKS,
64-66 SOUTH CANAL STREET, CHICAGO, ILL.

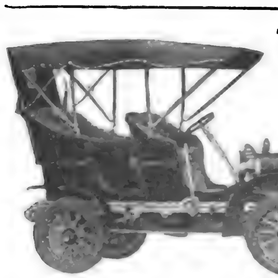
F. W. Ofeldt & Sons,
Nyack-on-Hudson, N. Y.
Manufacturers of
Blue Flame Kerosene Burner,
Safety Water Tube Boiler,
Automatic Water Regulator,
Automatic Fuel Regulator,
Feed Water Heater,
Compound Steam Engines,
New Automatic Fuel Feed.
For all makes of steamers, including White's and Stanley's. Write for new Catalogue.



THE BROCK CARBURETOR
(Patents Pending.)
New Idea, Old Methods Reversed
LET US TELL YOU WHY IT IS BEST OF ALL.
Write NOW for Circular.
A. A. BROCK,
86 La Salle St., Chicago, Ill.

GASOLINE STORAGE UNDERGROUND OUTFITS
$12.50, $25.00, $35.00, and up.
GOOD GOODS. LOW PRICES.
LUBRICATING OIL TANKS ALSO.
$3.50, $5.25, $6.50, $10.00 and up.
Cabinets, $15.75 to $100.00.
Oily Waste Cans, meeting insurance requirements.
Accurate Measures, and good funnels.
Kamp Kook's Kits that please tourists.
Ask Your Dealer. Send for Catalogue.
MANUFACTURERS SINCE 1869.
F. CORTEZ WILSON & CO.,
247 LAKE STREET, CHICAGO, ILL.

THE AUTO TOP CO.



We Want your 1908 Orders. Get our prices before buying.

209 E. Columbia St., Fort Wayne, Ind.
MANUFACTURERS OF
AUTO TOPS
that are neat, durable, and made to fit all cars, large or small; try us on **RUSH ORDERS**.

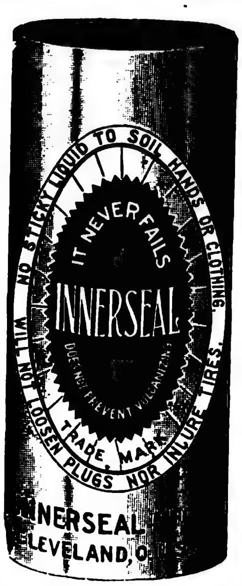
THERE IS MONEY

IN BRAZING CAST IRON. LET US SHOW YOU. COMPLETE EQUIPMENT.
BEST COMPOUNDS
THE A. & J. MFG. CO.,
18 W. RANDOLPH ST., CHICAGO, ILL.

Auto Tires

New and Second-Hand Tires Always in Stock
RECOVERING and REPAIRING a SPECIALTY
Call or write for price list
Broadway Rubber Tire Works
51 WEST 63D ST., Near BROADWAY
Telephone, 5384 Col. NEW YORK CITY

INNERSEAL



is the GREATEST
Automobile and Bicycle Tire PUNCTURE REMEDY
ever produced.
Will positively mend any reasonable size puncture.
We guarantee INNERSEAL to do exactly as recommended.
If your dealer don't have it, write us and give his name, and we will see that you are supplied.
Innerseal Mfg. Co.
321 Frankfort Av

AUXILIARY REVOLVING CHAIR SEATS

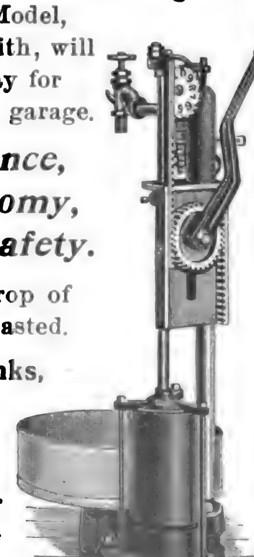
Pat. Apl'd For.

Now is the time to place your order for a pair of the G. & C. AUXILIARY SEATS, hand-forged, made for service and with an enviable reputation. Easily attached in Tonneau or Motor Boat. Made to fold up when not in use, and revolve to side of car. Sold in the white, or upholstered with any material desired. Write for prices. HEADQUARTERS for HIGH GRADE AUTO BODIES of every description.

TAXIMETER CABS & LIMOUSINES SPECIALTIES.
We solicit your patronage.
GRAVES & CONGDON CO., Amesbury, Mass.

Eastern Self-Measuring Pump

Our 1907 Model, shown herewith, will quickly pay for its lf in any garage.



Convenience, Economy, Safety.

Not one drop of Gasoline wasted.

Gasoline Tanks, Pumps,
Complete Storage Outfits.

Get full information by writing to
Eastern Oil Tank Co.
Lowell, Mass., U. S. A

Automobile Dealer and Repairer

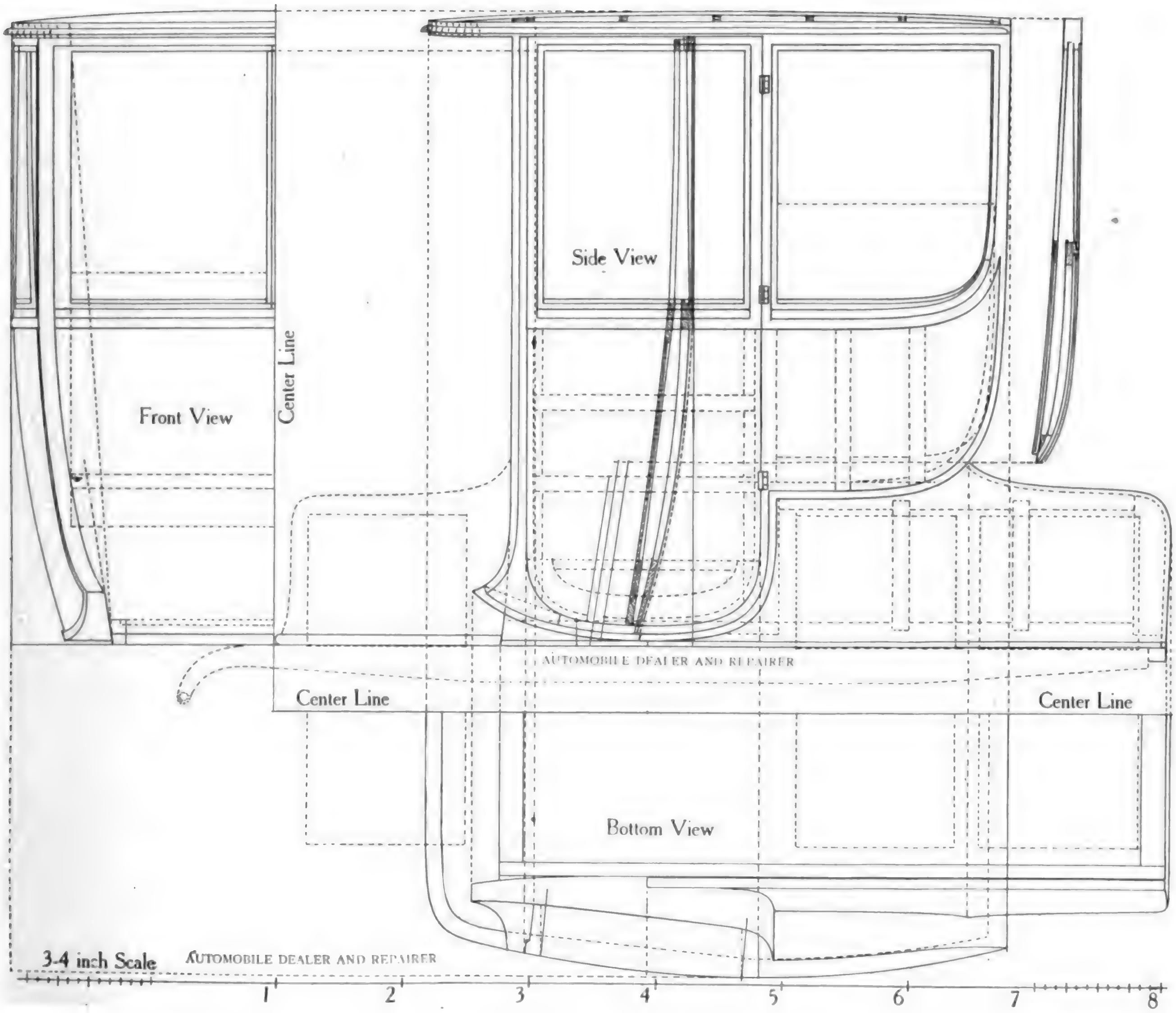
A PRACTICAL JOURNAL EXCLUSIVELY FOR THESE INTERESTS.

VOL. V., NO. 3. NEW YORK, MAY, 1908. PRICE { 10c. PER COPY $1.00 PER YEAR

BODY FOR AN ELECTRIC.

Full Directions for Building One for a Physician's Use in Cities.

In cities and suburban districts, or wherever charging facilities are at hand, electric driven carriages possess certain advantages over the horse or gasoline car in motive power. This power is unequaled for runabouts for ladies' by physicians, many of them do not like the inferior workmanship and miss the necessary conveniences of which the doctors have made use in their carriages. For this reason they prefer to buy the chassis, and the carriage builder does the rest. The outlines of the body, its workmanship and finish out and inside must be tasty, comfortable to ride in, well closed during the cold season and well open during the hot weather. The carriage builder knows how to fit the glass frames and doors, to



carriages and for physicians' use. The use of the electric current has become so general that there is scarcely a town of any consequence where batteries cannot be charged. The electric vehicle at the present time is much more efficient than that produced three or four years ago, when forty miles only could be made on a single charge, and eighty can be made at present.

Although electric driven carriages are often preferred

avoid draft when it is cold, and the carriage is built so that during the hot weather all the glass frames can be dropped into the berths out of sight, making almost an open carriage.

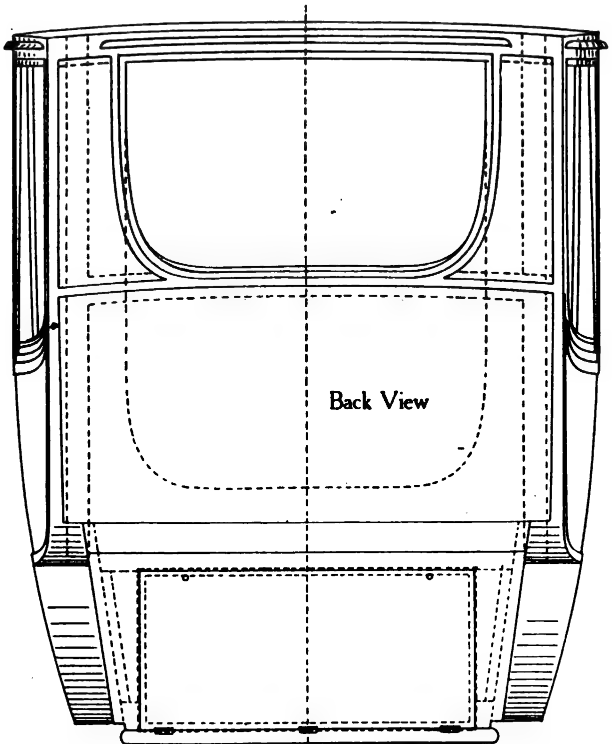
The glasses in the rear upper side quarters are generally stationary, but the city physician wants them to partly drop; the rear glass frame must be large so as to create a draft in hot weather. The seating room must be com-

fortable and roomy. The woodwork throughout the entire body must be exceedingly light.

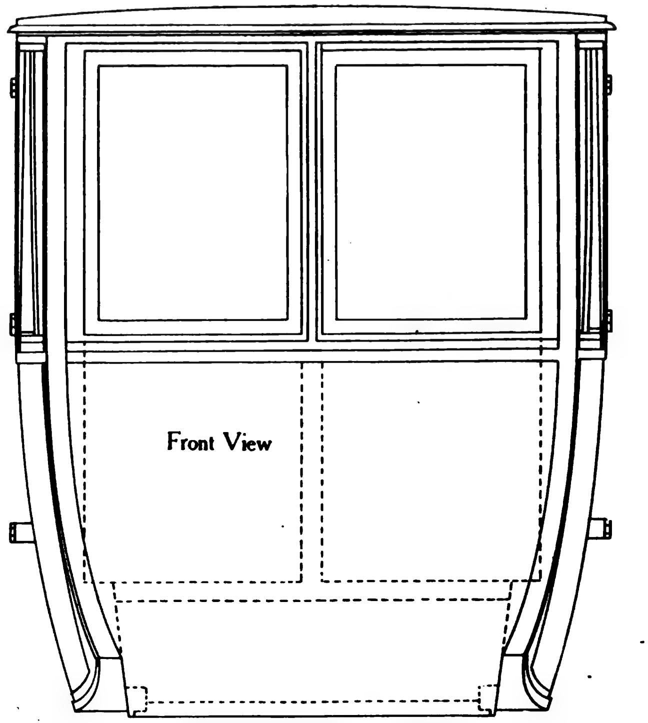
TECHNICAL DESCRIPTION.

The Rauch & Lang chassis is 30¾ inches wide, out to out, and as the body sills are level with the outside of the chassis, half of this width must be marked down on the draft or bottom view. The widths of the body front of coupe pillars, hinge pillars and back corner pillars are 45 inches, 50 inches and 46 inches. The amount of turn-under is 5 inches each side. The rear of the lower body is built up 1 inch on each side from the frame work. When the frame work is done, as shown by dotted lines, a 1-inch thick piece is glued against the frame work. The bottom joint of this piece on one side is shown on the bottom view. It is notched in about the middle of the door groove hiding most of the joints with the exception of the two vertical ones. The door rockers are dressed parallel with the center line, lengthwise, and upwards. They are dressed to the inclination of the lower body, which is shown by a short dotted line on the front view and also on the back view. These door rockers must be 6 inches thick, but the body makers contract them and by doing so can save about one inch thickness. The rear end of the door rockers are spliced to the hinge standing pillars.

The inside surface of the hinge standing pillar and inside surface of rockers run in the same direction, consequently the spliced joints can be gauged from the inside surface of the rockers. For the best built work bent wood is used for the outside door rockers, but if it is not on hand, they can be made of two pieces on each side. The same holds good with the back corner pillars, but if they



AUTOMOBILE DEALER AND REPAIRER



AUTOMOBILE DEALER AND REPAIRER.

into the door rocker; the thickness of the sills is drawn on the bottom view and the rest of the lines are obtained as usual by deducting the amount of turn-under from the top rail curve.

The size of the door pillars as drawn on the side view is obtained by moving a stick the size of the glass frame up and down without any strain, but the pillars must be made as light as possible. The coupe pillars are dressed square lengthwise, and up and down, as indicated by dotted lines from bottom to top on the front view. By doing so 5¼ inches thick stuff is needed. Above the glass frame line most of the thickness has to be removed anyhow, therefore the pillars can be made from 4½ inches thick scantling in the rough and still have sufficient left for dressing and beveling. Note the vertical glass frame line running down the pillars. All this wood must be removed for the glass frames to drop down to the horizontal dotted line, but must not be removed on the door pillar side. All that is required to remove is the wood for the glass frame to drop. The bevel must be planed on those pillars for the doors to shut against, which is shown on the bottom view. The front outside surface is planed straight across.

On top these pillars have tenons and are mortised into the top rail; at the bottom they are mortised into the door rocker with a lap on the outside which enters into the are spliced, the splice must be below the body panel, so that the spliced part can be glued against the panel. The arm rails must be dressed after the contracted line and curved same as the top rail line. The top rails are dressed square and the upper surface is planed to meet the top curve bend.

The door pillar is drawn separately in the side elevation of the body, to show the shape and also how the routered part is shaped for the glass frame to drop. We show the same for the back light, which is also made to drop. There are five top curves, which are ¾x¾ inches. The top boards are ¼-inch thick and the width is to suit the boards on hand. The end curves are on front, 1½ inches square; above the coupe pillars 1½x2¾ inches, and on the rear end, 1½x2⅜ inches. The top boards are routered into the top rails, front curve and back cross bar.

If the rear door pillars are started from the side surfaces of the lower part of the body, as shown on the back view as indicated by dotted lines, the thickness of pillars must be 5 inches, but this is not necessary, as the body must be constructed as light as possible. Make them 1½ inches on top rails; square down both sides as shown by the dotted lines, making the pillars on the standing hinge pillar 3 inches thick only. The rest of the thickness is glued against the pillars and the inside surface is beveled

after the flare of the lower body. The doors are hung on three bent hinges on each side as shown on the side view and should be planed as drawn.

The chassis is made from cold pressed steel and joined by drop cross pieces of the same material. The spring hangers and stubs are drop forged and the springs of the best Swedish steel. On physicians' coupes one demi-elliptic spring is used on each side in front and full elliptic springs in the rear. A pair of internal expansion hub brakes in the rear wheels are operated by the foot. The brake shoes are lined with maple, set on edge, and are inclosed and adjustable from the outside so as not to require the removing of the wheels.

Timken roller bearings are used in both front and rear axles and are well closed so as to exclude dust.

The batteries are located in front and rear directly over the springs, and are so placed as to equalize the weight over the two axles, as shown by the dotted lines; but another battery can be placed under the seat if necessary and all are indicated by dotted lines on side and half bottom view. They are readily accessible. There is not only a rear lid, but also one on the top.

In an electric automobile power may be applied in different ways, and the designer and builder must use good judgment in so combining the parts as to secure efficiency, strength and reliability. The double chain drive on electric vehicles has the flexibility obtained by the use of two independent motors operating on the two rear wheels, along with the higher efficiency of the single motor. This mode of construction does away with the use of bevel gears whose efficiency is admitted to be 10 to 15 per cent. lower than that of a chain, and most important of all is that it eliminates the divided rear axle, which is a source of annoyance and repair.

Benzol and Gasoline.

Interesting tests of benzol as a fuel for automobiles have been conducted recently by Joseph Tracy, concluding with a thorough comparative test of gasoline and benzol as fuels upon the new dynomometer of the Automobile Club of America. Afterwards Mr. Tracy made the statement that he was convinced that the fuel question was settled by the result of his experiments and those made abroad with benzol, and that American automobilists need have no fear that the expected scarcity of gasoline would cause any hindrance to the spread of automobiling in the next few years.

Benzol, the new fuel for internal combustion engines, consists of a mixture of benzine, toluene and xylene, and has a specific gravity of 885 degrees. It commences to distil at about 176 degrees, and does not completely distil over until nearly 248 degrees Fahrenheit is reached. Benzol is produced as a bi-product in the manufacture of coal gas, and is water white in color. For use in automobiles but little change need be made in the carbureter, as it gasifies almost as readily as gasoline. As benzol is much more powerful than gasoline, a motor, running with it, requires a much smaller amount, and the carbureter must be adjusted to feed but a small amount for each explosion. Benzol having a higher specific gravity than gasoline, it is also necessary to readjust the float and needle valve of the carbureter, after using gasoline.

Favors the Make and Break.

Here are the views of a champion of the make and break system of ignition as compared with the jump spark system:

"To get a line on the electrical energy of the two systems, a person has only to use his eyes to see that the metal points at the sparking plug are comparatively fine and delicate, while on the make and break system they are large and strong, which only means that the electrical energy developed by the make and break system would, in a few moments, destroy the sparking points of a plug.

"The make and break system of ignition has many times the electrical energy of the jump spark. This is not a question for debate, it is simply a fact that is admitted everywhere by technical men.

"Given two cylinders of exactly the same size, working on the same mixture, the make and break system of ignition will develop more power, because of the instantaneous ignition of the gases. It also will ignite charges which are either too rich or too poor. In other words, if, for some reason, the mixture is incorrect in proportions of air and gas the make and break system will explode this charge and the jump spark system will not.

"Another point which cannot be overlooked is the fact that with the make and break type of ignition the spark advance needs but little attention. It therefore relieves the driver of the annoyance of constantly manipulating the spark lever.

"The theoretical advantages of the make and break are not appreciated by many automobile users, and perhaps it is not going too far to say by many automobile manufacturers. They are too apt to consider it as an accessory which can be best bought on the outside, while, as a matter of fact, it is the life and soul of the motor."

Shortage of Medium Cars.

"There's going to be a big shortage in automobiles this season," said Benjamin Briscoe recently. "I know that statement will surprise those who are not familiar with the inside of things, and who imagine that the automobile industry has been hard hit by the recent panic, but I make the assertion only after the most painstaking investigation. In round numbers I would say there will not be enough cars by 10,000 to meet the demand for 1908. Here are some of the reasons:

"First—Our own delivery specifications, as well as the monthly reports from our agents, indicate that the demand for cars—and I include all classes up to $3,000—is not one whit less than it was last year at the same time. There has been a slight falling off in the East, but there is a corresponding increase all through the West and Middle West.

"Second—Most factories have in anticipation of hard times cut their output down from 33 to 50 per cent. One of the most prominent makers who turned out 1,500 cars last year and originally intended to make 2,000 this season, reduced orders for material to 1,000 sets before the recovery of normal conditions became apparent. It is too late now to increase their output. Several smaller concerns who built 300 to 500 cars last year will this season turn out 200 to 300 cars respectively. The reduction amounts to fully 20,000 cars in the aggregate.

"Under normal conditions there would have been a demand for at least 20,000 cars over that of last year—most makers put it at 30,000 to 40,000. But basing it on a demand equal only to that of last year—and our returns show it to be a great deal heavier—there will be a shortage in cars selling under $3,000 of at least 10,000. As for the higher priced types, I think makers of standing and reputation will easily sell all they can build."

Keep the Gauze Clean.

The small gauze discs fitted in the fuel pipes in most cars are the cause of some of the erratic operations of the motor. If this gauze is not frequently cleaned it will choke up with dirt from the gasolene and prevent the proper supply of fuel from reaching the carburetter.

GARAGE SUGGESTIONS.

A Few Points That May Help Builders of Small or Large Houses.

In constructing a garage proper space should be allowed for getting around the car or cars. Space between the car and the walls at both sides and ends should be ample. This should be at least 2 feet 6 inches where a pit is provided, but if the latter does not exist, and the car is raised for underwork, the space should be 3 feet. In the case of several cars standing side by side, there need only be 2 feet 6 inches or 3 feet between them. The height of the doors should be sufficient to pass in a car with the hood up, plus its luggage rail, and, possibly, tires on the roof, or, say, 9 feet. They should be at least 8 feet wide in the clear, and may be either steel revolving shutters or they may be hinged—opening outward, of course—and preferably under a pent-roof. Sliding doors may be used if convenient. For the garage for one or two cars not much height is required to the roof-plate, and 8 feet will be found a good minimum to start from. The walls should either be faced to a height of about 4 feet from the ground with glazed bricks, or lined with tiles. They should have a curved brick or tile at their junction with the floor, to avoid the harboring of grease and dirt. All angles to recesses—such as that for the hydrant of the radiators—should be rounded, and there should be as few projecting features as possible. Just above the floor level in each external wall should be inserted air-gratings. They should, where possible, be placed behind the small radiators.

In the larger number of garages cement is laid to a smooth finish, but granolithic offers less opportunity for injury from dropping oil. Stone flags, laid not on a concrete but on sleeper walls for the advantage of the air space beneath thus obtained, seem to add still further to the risk of the dangerous sparks that may result from the car coming in or going out with a chain or stud anti-skid appliance fixed on the tires. Again, unless the space beneath is of considerable size—a cellar, in fact—there would be the danger of its forming a chamber where explosive gas could collect as the result of leakage. The drains should not be underground pipes, but open, half-round channels.

In cases where it is incumbent to make use of the pit, the best size for this is 6 feet by 3 feet by 4 feet 6 inches or 4 feet 9 inches deep. Its sides should be lined either with glazed bricks or tiles, and it will be found convenient to form in them a recess on each side in which the chauffeur, when at work, can place his tools from time to time. Iron ring steps afford access to it. An expert strongly advocates the extension of the pit beyond the outer wall of the garage, as tending toward a certain amount of ventilation at all events, and as giving means of escape for the chauffeur, who would otherwise be shut up in a trap in case of fire. It will be found well to lay on the floor coarse sand, which should be constantly removed when impregnated and foul, and, of course, there should be a liberal provision of drip-pans.

It is not of great use placing a skylight above the pit, since the car, when standing over the latter, naturally blocks out the light. A long bow window quite near the floor is a better arrangement by far, and can be made also to help in the ventilation so desirable.

A garage should be of fireproof construction, the roof no less than its other portions.

Exterior to the garage proper a covered washing place should be provided, to allow of a thorough washing down, whatever the weather may be.

The gasoline store is a highly important feature of the garage. In case of a small garage gasoline may be kept in two-gallon cans, the store of which should, wherever possible, be at least 20 feet away from any other building, and should be of fireproof materials, with iron door and its walls provided with ventilators having gauze protection. The floor of concrete, coated with cement, should be sunk below the ground level, and the door should have a raised sill. This sunk space is filled with sand. The cans should be close to the doors in order that they may be easily accessible, and that the chauffeur need never stand inside.

It is of importance that there should be no risk of the temperaure of the motor house falling to freezing point. As regards, however, the heating and consequent drying of the atmosphere of the garage, there are two conflicting claims to be satisfied. Expert carriage builders claim that, in behalf of the painted body, that the house cannot "be too dry." But, on the other hand, it is known that rubber tires keep better in a damp than a dry room. The better plan is to keep between the two—neither too damp nor too dry, but dry rather than damp. The temperature should be about 60, if possible. In a garage of any size it will be an advantage if a small closet be provided with a radiator for drying rugs or cushions and ventilation to allow the escape of the resultant steam. There should be hydrants and chemical extinguishers to guard against fire—and incidentally to keep the insurance rates down. The daytime lighting should be effected by windows which do not admit the south sun, and, if by skylights, they should have the usual studio northern aspect. For the artificial light there is none that can compare with an electric system. But if this is not available, the lamps should be on the outside of the windows if possible, so that the light may play into the inside of the room.

The storage place for tires, testing apparatus, pumps and spares generally should be distinct from that in which cloths, cleaning oil, brushes, waste, etc., are kept on metal shelves, and with proper ventilation. There should be rack or shelf accommodation for rugs, extra cushions, and the like.

The workshop is a feature as to which the owner of the car always has his own views. He may merely wish to have simple repairs made there, or he may be himself, or else employ as chauffeur, a skillful engineer, whose pride is that the car need never go back to its maker in case of mishap and consequent repair. In the latter instance, a lathe, a drilling machine, a forge—perhaps an anvil—would be asked for, and if heavy parts have to be dealt with, a portable crane, or a differential hoist would be found of much use. Of course, when forge or blow-pipe work is done, it should not be in any part of the building directly accessible from the motor house itself. In any case, a full-size work-bench will be needed, so placed in front of a window as to be well lighted, and provided with a good vise, preferably of the swivel type.

Proper drawers, shelves and tool racks must be arranged for.

The principles and conditions which obtain with regard to the smaller home of the automobile are, in the main, applicable to the larger and generally public garage. A garage may be built for one of two purposes: It may be meant for some special use, such as housing a number of cars belonging to one particular company or proprietor, or it may be meant to receive and house cars of various descriptions and sizes placed here for a longer or shorter time by their owners. In the former case, what has to be kept in view—and with motor-omnibuses especially—is the fact that the vehicles come in and go out in some special rotation or order, and that the earliest to leave in the morning should have facilities for being so stabled in order to do so they disturb as few as possible of those placed in front of them.

Effect of Speed on Tires.

The Diamond Rubber Co., Akron, Ohio, in reference to the effect of speed on tires, say:

"We should not undertake to make any definite statement as to the comparative length of the life of tires driven at different speeds, but of course no tire can stand up a great while at 70 miles an hour, and the man who drives at an average of 20 miles an hour or less will get more than twice as much service from his tires as the man who averages from 30 to 50 miles an hour. First, last and all the time it is the user who gives his tires attention, keeps them well inflated and minor injuries repaired, who gets maximum economy and satisfactory service. We find that the user who habitually gives his car proper attention, keeps it well lubricated and all that, is the man who also looks after his tire equipment, and for this reason gets the best results. But to so great an extent does the element of luck and chance enter into any proposition involving the probable life of a tire, that it is impossible to predict just the extent of mileage any user will obtain." They also add their warning against using improperly inflated tires, the effect of which is constant contraction and expansion of the tread and a constant bending of the walls, neither of which occurs to any considerable extent when the time is pumped up sufficiently hard so that it will not flatten even under a fully loaded car.

To Prevent Skidding.

An inventor has brought out a device which will do away with the skidding of cars almost entirely, according to a Chicago doctor. He says it is a clutch which acts as an automatic distributor of the power to the slow wheel, thereby practically eliminating the differential gear, which he asserts is the principal cause of skidding. The physician declares that chains and other anti-skidding devices to be used on tires act only as a malicious, unscientific and irrational aid. He is not opposed to the use of chains when pavements are covered with snow, but says it is unreasonable to use them when the streets are simply muddy and wet or when they are dry. He says he has often ridden in a machine equipped with the Chicago inventor's device, smooth tires and a solid axle, and knows that it will not skid when the brakes are applied, in starting or turning corners, no matter what the condition of the roads may be.

Don't Keep the Water Jacket Cold.

If the water in the jacket is forced around the cylinder so as to keep it cold the heat from the combustion is cooled down so quickly by radiation that the expansive force of the burning gases is materially reduced, and consequently less power is given by the motor. The object of the water is not to keep the cylinders cold, but simply cool enough to prevent the lubricating oil from burning. The hotter the cylinders with effective lubrication the more power the motor will develop. It should be remembered that a hot motor is the most economical in fuel.

UNJUST LAWS.

Automobile Owners Resent What They Consider Unjust Discrimination.

The complaints of automobile owners at unjust laws of various kinds is constantly becoming better defined and more general. They are taxed for good roads which they do not get, and for various other things that seem unjust, and many of them are now asking where the money goes to. Take the case of a Connecticut owner of a White Steamer. He pays a property tax of $23, and has paid much more in the way of licenses in the course of a year. But during last year he drove his car 1,051 miles, and mostly over roads that were a little better than cart paths. There is but one mile of State road within a radius of eight miles of his home, and he says he drove over that piece of State road only three times during the entire period. There seems to be good ground for complaint here, and something ought to be done to make matters better. But Connecticut is not the only State that offends. The registration law in Massachusetts has never been popular with motor car owners, and it never will be. An automobile owner of Gardner, Mass., objects to this annual fee system, as he says it is virtually double taxation, and he is right. He says:

"The automobile is one of our great modern inventions. It supplies a most wholesome and fascinating form of sport and combines with it effective service. The combination is irresistible. In the course of a generation we shall have thousands where we now have one—if the cost can be reduced to the level of the average man. The great obstacle in the way is expense.

"The industry is in its infancy. Experimental work is always expensive. Machines sell with a large margin of profit, supplies and repairs are greatly overcharged. With the utmost care the owner of a car will find its upkeep more costly than it need be, more costly than it will be when the industry is once fully established and values are better understood.

"Meanwhile the man of moderate income, who has the temerity to invest in a machine faces a serious problem. He must at one and the same time practice the most rigid economy and deal with a public that believes him immeasurably rich. Because this man already represents the majority of car owners and because the future of the automobile lies in his hands, he deserves a little thoughtful attention. He does not ask or expect favors, but he deeply resents unjust discriminations. The new registration law illustrates the point in question.

"The original registration law was a measure for the public safety and served to connect the owner with his machine. For this purpose an annual registration is no more required than the yearly renewal of a marriage certificate. Once registered the identity of a car is fixed until there is change of ownership, and no additional expense is involved. The new law is a measure to provide additional revenue. No attempt was made to conceal the real object. It levies a yearly fee of five dollars upon each machine in order to provide more money for State roads. Automobiles destroy the roads, and they should pay for

them. Could anything be more in harmony with simple justice?

"In the first place every automobile owner pays a property tax upon his machine. The present writer pays an annual tax of thirty dollars upon a medium priced, twenty horse power car. Probably this is no more than an average. The commission expects there may be as many as fourteen thousand cars in the State, but if we call it ten thousand, it gives a grand total of three hundred thousand dollars ($300,000) every year.

"If it is true that automobiles do special damage, it is also true that they add materially to the available revenues of town and State. It is probably no exaggeration to say that half of the three hundred thousand dollars is clear gain. Money now invested in cars would otherwise remain invisible and escape taxation entirely. If the State needs more money for the repair of roads, she has a just claim upon this new source of revenue. Let her take what she needs. There is everything to be said in favor of this and nothing against it.

"In the second place the automobile owner was a taxpayer long before he owned a car. He has done as much as any other citizen in making and maintaining the roads we now have, while at the same time he may never have used them. A good half of those operating motor cars are making direct use of the highway for the first time, although they have helped maintain them for years. Why should he now pay a special tax for the use of what belongs to him as much as to others? Certainly the right to use the highway within reasonable limits is not a special privilege with a price, but belongs of right to every taxpayer in the State.

"The highway is open to all without measure and without price. Men use it much or little, as they please, and the stranger goes his way without challenge. If we contemplate the traffic upon our streets, we shall find a small group of men in the narrow circle of employments making more use of the roads than all the rest taken together. Some of them are engaged in heavy and destructive teaming, but no restrictions are put upon such use and no special tax is imposed.

"The automobile owner has a right to resent such discrimination. If he must pay, let these others pay also. And if after generations of exemption the use of the highway must again become a special privilege, it will be better to convert our State roads into toll roads and let each pay as he goes.

"But the new law is quite inconsistent, and denies on the one hand what it affirms on the other. It levies a special tax on the automobile, because it does more damage than the horse-drawn vehicle, while the tax upon all motor cars is made uniform—in spite of the fact that some machines will do ten times as much damage as others. The man with a light car and low mileage must pay exactly the same as the man who drives a heavy car at express speed for thousands of miles a season. A car of two thousand pounds or less at an average speed of twenty miles per hour does very little harm to the road, probably not as much as the loaded team. The very same car with the rate of speed doubled will do four times as much damage, and when the weight is increased in the same ratio the injury to the roads is entirely out of proportion to the apparent changes in conditions.

"The reasons for this are easily evident. Any material has a given amount of resistance to strain and wear. Within this limit the wear is slight, while beyond it is swift and destructive. For a given charge a rifle barrel may last for ten thousand rounds, and with the charge doubled burst the first time. A steamer boiler will endure for years under a given pressure and explode directly if the pressure is carried much above that point.

"The same law governs the relation of the automobile to the roadbed. It is not unusual for a high-powered car to weigh, when loaded, between five and six thousand pounds, and when driven at a high rate of speed the roadbed is loosened and destroyed. Such a car will do more damage than a dozen of the ordinary type, while the man who drives this kind of car can afford to drive the most miles. Some of these cars make a mileage of fifteen to twenty thousand miles in a year, and a comparatively small number of such cars are responsible for an amazingly large proportion of the damage done to our State roads.

"No man can be satisfied with the level tax except the man who drives the high-powered car. Thousands of automobiles in this State are doing no more harm than the average loaded team and should be treated accordingly, while a few are so hopelessly destructive as to justify complete suppression.

"Let me call attention in passing to the administration of the law as interpreted by the Highway Commission. They have just ordered fourteen thousand sets of number plates to replace those now in use. The old ones are as good as ever, but must be thrown away, while the new ones cost the commission at least a dollar a set. At any rate, the individual owner must pay a dollar for the single plate if he loses one. Here is the sum of fourteen thousand dollars thrown away in the scrap heap, and if we consider the expense of postage, printing, and clerical service, the cost to the commission cannot be much less than twenty thousand dollars. This is nearly half the sum needed for repairing the roads, and as a device for enforcing the law must come every year.

"Here is a vivid illustration of the extravagance that prevails in public service. This does not count the cost to the car owner in making the change of numbers upon his car nor does it mention the inconvenience which it entails."

Air and Water Cooling.

While air cooling has not made great progress in point of numbers of makers using that system, it is believed by many engineers that the future will show more air cooling motors.

The air cooled or natural circulation method is used by many makers, and in this arrangement hot water rises and passes upward to the radiator, while the cold water from the radiator settles and passes down to the cylinder jackets. This gives a more rapid circulation as the engine becomes hotter, and is thus a theoretically correct method and one which, with large sized piping, works perfectly.

Other makers, because of long piping or fearful of improper circulation, prefer to fit a pump by which water is forced through the pipes. These pumps are of two or three varieties. The centrifugal pump, wherein the water enters at the axis and is thrown out at the circumference by centrifugal force, is the most common variety. The gear pump, consisting of a couple of tooth gears meshing on one side and carrying water on the other, is next common in use. It is positive in action, not easily clogged and not liable to give trouble. Eccentric sliding valve pumps are also used and form a simple and efficient device for the purpose.

The common plunger pump is not much used in connection with motor work, although there seems to be no reason for its neglect, since it is giving good satisfaction in other lines such as on motor boats. Modifications of these styles are seen occasionally, one of them being a disk pump in which a flexible disk or diaphragm takes the place of a plunger and with a slight movement of its large area back and forth the water is drawn in and expelled

from the pump chamber. This disk is in some instances impelled by the pressure of the exhaust gases, and thus it requires no power from the motor and saves the noise and care of a propelling means, for no matter how carefully made, the pump shaft and its stuffing box must be lubricated and cared for. It is because of this needed care that the pump is objected to by many, and the air cooling and the natural circulation looked upon with favor.

The Single-Cylinder Car.

W. E. Metzgar, of the A. L. A. M., says: "As to the future of the single cylinder car there can be no reasonable doubt. The bulk of the expansion of the automobile business must come unquestionably from the great middle class to whom the horse and buggy has heretofore been the height of everyday traveling luxury. The car which comes nearest to the horse and buggy in cost of operation and maintenance as well as in simplicity, service and durability, is bound to be the type that will supplant 'Old Dobbin' and the 'one-hoss shay.'

"That the single cylinder car, rightly made, is the type that meets these requirements no person who knows anything about the subject will deny. It not only fills the place, but with its possible speed of thirty miles per hour and capabilities of going anywhere, what is more logical than that the one-cylinder not only may, but must, have before it an almost unlimited growth.

"When it is considered that during the last five years the Cadillac Company has made some sixteen thousand of its single cylinder cars, and, so far as it knows, every one of them is still running, and when so many of them are seen on the streets of nearly every civilized city of the globe, it is hardly to be wondered at that the company is looked upon by unknowing persons as exclusively small car makers."

Wear of Steering Tires.

It can scarcely be wondered at that, in certain instances, the tires on the steering wheel wear out in an abnormally short space of time. This is largely the result of careless handling of the steering. The tires on the front wheels, as every practical motorist is aware, should have at least twice the useful life of the driving-wheel tires. The front pair of wheels simply have to roll along and support a moderate proportion of the total weight of the car. There is entire absence of the disruptive stresses due to the driving torque and braking reaction which rear tires have to bear. To obtain the normal life of the steering-wheel tires there is an important condition—the wheels must be in absolute alignment with the track of the rear wheels, and there must be perfect parallelism. Instances are to be noted every day in which the driving is of such a careless order that the steering wheels are forced permanently out of track through the habit of some drivers in drawing up to the curb at a considerable angle and actually causing a collision between the curb and the wheel. There could be no practice better calculated to permanently upset the steering and result in the skidding and dragging strain being thrown on the tires. The evil effects of such careless driving are also felt in the stiffness and want of sensitiveness generally in the steering.

Damages Awarded.

Where an automobile was standing properly facing against the curb and a wagon with a projecting ladder, having ample room to pass, turned so that the ladder tore the top of the automobile, it was held that judgment should be in favor of the owner of the automobile for damages. Denny vs. Strauss, 143 N. Y., St. Rep. 26.

Nonalignment of Engine and Gear Case.

Strict accuracy in the alignment of the engine and gear case is not called for in the case of cars which have a universally jointed piece between these two units, but non-alignment in cars not so provided is productive of various troubles. With the clutch making a comparatively rigid connection, it is obvious that bending strains will be set up in the shaft and also bindng in the bearings, which also means absorption of power, excessive and uneven wear on the bearings, and deterioration of the shaft through crystallization.

In the common type of cone clutch, where the flywheel forms the female member and the male is mounted on the first shaft of the gear box, non-alignment will be indicated by slipping of the clutch, but in clutches of the self-contained variety, having both members carried on the same shaft, this indication, if present, will be due to other causes which will be considered later. It is seldom possible to dismount either member of a cone clutch of the above type without first moving either the engine or gear case, so before doing this try a feeler between the two members when the clutch is in. Feelers for this sort of work consist of thin blades of steel of different thicknesses hinged in a handle like a pocket-knife, and can be purchased at any tool makers. If it is found that the feeler can be inserted at one side of the clutch and not the other, the gear box must be moved one way or the other to bring it true, or it may have to be raised or lowered a trifle. Thin pieces of tin or sheet brass under the arms are usually employed for this purpose, and, by adding to or taking from these, the desired position is obtained. When it has been adjusted so that it is impossible to get the thinnest blade of the feeler inserted at any point after the holding down bolts have been tightened up and the clutch let in, the alignment will be sufficiently correct. In clutches of the expanding type the same course may be followed, but in either case the slipping may be due to other causes.

Frightening Horses.

"Though automobiles are lawful vehicles and have equal rights on the highway with horses and carriages, their drivers should operate them with that degree of care and prudence and that consideration for the rights and safety of others to be expected of ordinarily prudent and humane persons. Being heavy, powerful, fast and noisy, motor cars, if carelessly handled, are as terrifying as they are dangerous. A reasonably considerate person in the situation of defendant would have anticipated the danger to the safety of the occupants of the buggy in running his car headlong in such close proximity to the horse. The possession of a powerful and dangerous vehicle, instead of giving defendant any right of might, imposes on him the duty of employing care commensurate to the risk of danger to others engendered by the presence of his vehicle on the public thoroughfare." The defendant was held liable for frightening the horse. Hall vs. Compton, 108 S. W., 1122 (Missouri).

Damages for a Workman.

Where a man oiling a curve on the street car tracks was working backwards and was struck by an automobile, it was held that the liability was different where a workman was required to step backwards from that of an ordinary pedestrian, as the latter would be guilty of contributory negligence, but in this case it was for the jury to determine whether the plaintiff was guilty of contributory negligence or not, and their verdict for the plaintiff is conclusive. King vs. Green, 94 Pac. 777. (Cal.)

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NEW YORK, MAY, 1908.

Missing Numbers—Our readers are requested to remember that it always gives us pleasure to re-send numbers which have gone astray in the mails.

THE FUTURE CAR.

From the amount of service it will perform and the pleasure and comfort it will give, the automobile is the cheapest thing that exists at the price. But it must be admitted that even now it is not perfect. There are chances for improvement in detail, although we do not expect to soon see much reduction in price—not while raw material and labor are worth as much as they are at present. One cannot buy a good, serviceable carriage for less than $200 or $300, and this without the most expensive part, the horse or propulsive power. Then why should any one expect to purchase a serviceable automobile that must undergo three times as hard service besides carrying its propelling power—the engine—for anywhere near that amount?

But the car of the future will be easier to run and easier to maintain than the car of to-day. It will probably be about as different from the car of to-day as the car of ten years ago was different from that of the present. Whether it will have one cylinder or six, no one can foresee, but the tendency will be in the direction of simplicity. It is hoped that it will be far simpler in the matter of gears and clutches than the car of the period; but just how this can be accomplished those inventive geniuses who are now studying the subject must determine. When a man can get into his car and by the slight turn of a lever start it smoothly, and by a further turn of the lever control the speed, fast or slow, at will, the advance will be great, especially if the number of parts will have been reduced one-half or more.

KEEP THE GARAGE LOCKED.

It is noticeable that thieves have begun to break into garages and steal cars and other property. It is true that an automobile is a rather difficult piece of property for a thief to retain because its number and registration are liable to get him into trouble at any time. On the other hand, it is an extremely easy piece of property to get away with. A few hours will put it a hundred miles away from its owner and past recovery except with the greatest difficulty.

This subject is mentioned merely to put on guard garage keepers, dealers and those who have private cars in their own garages. Valuable property of this kind should be behind the strongest bolts and bars, and burglar alarms are not out of place as protective measures.

THE HIGHWAY LOOSE SURFACE.

Complaints of injury done to the highways by automobiles are increasing. Many of them are made without knowledge of the facts, and possibly some of them are due entirely to prejudice. In point of fact, the slow moving automobile does less injury to the highway than any other vehicle. But when the car is pushed from fifteen to thirty miles an hour, the tires sucking up the surface of the road and the wind carrying it into the adjoining fields, the case is somewhat different. In any event, automobile owners pay better than any other class for the use of the highways, and as this form of travel has come to stay it is well enough to take things as they are and try to make the best of them rather than to try to stay the wheels of progress in travel by bringing up unjust charges and objections.

As the automobiles are to be the principal vehicles on the road sooner or later, even if they are not so at present in many localities, it would be well to adapt highway construction in the future to their requirements. A light and loose road surface is of no use whatever for a speed of more than ten or twelve miles an hour, and this is the case as well with horse-drawn vehicles.

Something will be invented sooner or later for a hard and lasting surface for the highways as well as a suitable construction underneath it. When this is provided there will be no more complaints about the destruction of highways by automobiles, and, indeed, our roads will last longer than if used by horses and carriages with sharp shoes and calks and cutting steel tires.

HEAVY AND LIGHT TIRES.

Some one, who should know better, claims that heavy tires run no harder than light ones, using the illustration that a heavy fly-wheel runs no harder than a light one, after it gets started. But a heavy fly-wheel does run harder than a light one, and if it be twice as heavy, but of the same diameter and relative proportion, it runs twice as hard as the light one. Of course, it requires very little power to run either after it has got well started, and as the steadying power of the heavy fly-wheel is much greater than that of the light one, it better accomplishes the purpose for which it is used.

As we have before stated, there is no place where the draft is so increased as by adding weight to the periphery of the wheel. The car propels far easier with light tires than with heavy ones, but as light tires wear out much faster than heavy ones and are more liable to get punctured than heavy ones, the problem is not cleared up without taking this point into consideration.

In this connection, we have at hand the letter of a car owner who says he has recently been using one of the tire fillings and with the greatest satisfaction. He has had no tire bursts nor punctures and he fails to notice the slightest difference in the riding of the car. He concludes by saying:

"For my part, I cannot understand why motorists in general are not interesting themselves in substitutes for air, when by doing so they could get rid of all their tire troubles at once and reduce their tire bill by at least half.

If other people have experiences contrary to mine it would be interesting to hear them; but, for my part, I can only say that the detractors of substitutes for air whom I have met are in all cases people who have not used them and think they are solid tires."

Now this is all true, as far as it goes, but has our friend attempted to make any estimate of the extra propulsion power required by the use of the substitute for air? Of course this is not an easy matter to determine, but tire filling has weight, and weight at the rim of the wheel is something to be avoided as much as possible.

The fact is as we have stated: Heavy tires run much harder than light ones. That the heavy tire is more durable goes without saying, but this may be more than offset by the extra cost of its propulsion.

ABOUT 20 TO 1.

Discussion of the comparative merits of six and four-cylinder cars still continues. It is a matter, however, that should not provoke much difference of opinion.

That the six-cylinder can be made to run more slowly at a high gear, that it has less vibration and is more silent than the four-cylinder, and that it has an added advantage of not requiring the shifting of gear so often, goes without saying. On the other hand, four cylinders, of course, have fewer parts, require less lubrication and they seem to be more successful in high speed tests.

That the six-cylinder cars of a high power will continue to be used and give the utmost satisfaction, there is no reason to doubt. Their flexibility, smoothness and ease of control are great points in their favor. On the other hand, even the single-cylinder car has a great future. The future expansion of the automobile business will come unquestionably from the great middle class—from those who have heretofore either owned a horse and buggy or hired one occasionally. The car that comes nearest to the horse-drawn vehicle in cost of operation and maintenance as well as in simplicity, service and durability, is the single-cylinder, or at most the two-cylinder car.

In addition to the enormous success of the Cadillac single-cylinder car, of which 16,000 are in successful use, single-cylinder cars of the so-called "buggy-about" type are being built and used in the West in a constantly increasing ratio. Estimating the proportion as low as possible, there are at least twenty persons who want the simple and low-priced car to one who desires the high-power six-cylinder car.

CALL A HALT.

Those who assumed—and we were of the number—that this season would witness a decrease of automobile accidents now find their mistake. At this office there is received an account of about every accident of any consequence that occurs in the country, and, now that the season is at its height, they are just as frequent as they have ever been. But no one who has the best interests of the automobile at heart will attempt in the slightest to cover up or minimize them.

The automobile is here to say, and to finally become of universal use for all kinds of transportation. There is no cure for the accidents attending its use but to give them publicity, especially as not one in one hundred is unavoidable or due to any defect in the car itself.

It is hardly worth while to again repeat the statement that the automobile is far safer than the horse-drawn vehicle, for the fact is too self-evident. A car will go just where it is guided; a horse is liable to go just where he pleases. And if horses were driven on an average one-third as fast as automobiles, other horses would be frightened, accidents would be of common occurrence, vehicles would break down, and the highways and streets would be unsafe for all.

Automobile accidents are almost invariably due to ignorance and recklessness—to as senseless a craze for speed as can possibly be imagined. It is really lamentable that many should be prevented from buying a car and that the public should be opposed to its use simply because of this reprehensible folly.

It is time to call a halt. And a halt can easily be made by abolishing all fixed speed laws and making laws forbidding the driving of a motor car at any speed greater than is reasonable and proper, having regard to the traffic on the highway and other conditions. Such a speed is that which a prudent man would use in taking into consideration the time, place, condition of the highway, possible dangers, known obstructions, and the damage likely to result from driving carelessly at that particular time and place. Then punish the wilful violator of the law about three times more severely than he now is punished.

Do this, and automobile accidents will rarely occur, and not anywhere near as frequently as when horse-drawn vehicles are used. Do this, and it will give the self-driven vehicle a greater impulse toward its final goal of universal use than by any other step that can be taken.

LETTER AND SPIRIT.

Not long ago a car ran over and killed a lad in Brooklyn, N. Y., and the excuse of the driver was that he was going at "a slower than the legal rate." This is poor excuse, although it illustrates our claim in last month's issue that fixing a certain legal speed per hour is, and always will be, unsatisfactory. Dangerous speed may be two miles an hour in one case, and safe speed may be forty miles an hour in another, and yet each may be in accordance with the law. There is no case where the Scriptural injunction, "the letter killeth but the spirit giveth life," is more forceful than in fixing a rate of speed that shall be safe or dangerous in driving an automobile.

And here is another case where "the letter killeth but the spirit giveth life:" A man took his car across the ferry from New York to the Hoboken ferry to see some friends off on a steamer, a few steps away. He had a New Jersey license, but neglected to attach it to his car, as he intended to return to New York at once without driving in New Jersey. He was nabbed, however, by an officer, taken to court and fined $14.

The spirit of the license law is that cars must pay to use the highways. The spirit of the speed law is that the highways shall be safe for all who use them. The carrying of a tag and keeping within the speed limit are merely the letter of the law.

DEALERS ORGANIZE.

It is gratifying to note that automobile dealers everywhere are showing a disposition to co-operate in their own localities rather than to practice a competition that, in the long run, will prove ruinous to the trade. In the City of Spokane, Washington, there has been in the past a competition of a kind that might prove temporarily beneficial to individuals, but, in the long run, it could not but prove extremely disastrous. Knowing this, the dealers have formed themselves into an association wherein harmony will at least prevail. One of the members of the association says: "Its purpose is to bring about certain reforms and put the business of selling on a higher plane." He adds that there is no necessity for one dealer to "knock" another, as the cars handled there all have some good qualities.

As to that matter, there is really no one best car any

more than there is a best hotel, or a best restaurant, or a best church, or a best newspaper. In all of these there are, of course, some which have good points that others have not; but it is, perhaps, just as well that the public do not all desire the one thing in this world, whether it be spiritual, business, social or physical. There is a great variety of tastes, and what might prove a desirable car for one individual would prove an extremely unsatisfactory one for another. It does not follow, likewise, that the car that has the greatest reputation is best. Reputation and merit do not always go hand in hand; yet it must be admitted, speaking for the seller, that a well-known car is more easily disposed of than one which has not obtained a wide reputation.

Yet, even if this were not the case, it is not good business for a dealer to "knock" the cars offered for sale by their competitors. For a practice of this kind can be used by one as well as another, and, if used by all, it merely lowers the character of the business.

We should be glad to see dealers get together everywhere in their various localities and co-operate for trade betterment. By such a course they will sell more cars, get better profits, and, on the whole, serve the public better. Automobile manufacturers have organizations for the purpose of harmony and co-operation. Dealers who neglect to do so are placed at a distinct disadvantage.

THE PASSING OF THE HORSE.

It has been claimed, and with reason, that in the course of a few years the automobile will entirely clear the city streets of horses. Indeed, some go further than this and maintain that the horse is doomed everywhere, and that in the course of a generation he will be regarded with as great curiosity as the buffalo is to-day. This latter claim we do not agree to. But it is quite likely that he will soon be seen no more on city streets, and to the great benefit of the inhabitants, from a sanitary standpoint.

Stables are by far the greatest breeders of flies that exist, and although with a little care and a slight expense for disinfecting chemicals this might be prevented, no such sensible idea has yet been given the sanction of municipal ordinance, and probably never will be.

There are strong reasons why the horse has now no place in cities. The work he does can be performed quicker, cheaper and better, and in a far more sanitary way, with the automobile. In addition to this, the cost of street cleaning may be reduced one-half.

According to a writer in *Appleton's Magazine,* the substitution of the automobile for the horse in the city of New York would result in a saving of some $150,000,000 or $200,000,000 per year. Probably this is an exaggeration. But the main point of interest to manufacturers, dealers and repair men is that all will admit that the change would result in more or less saving, and this being so, the change is bound to come.

TIRE DESTROYERS.

In some cities agitation has started toward more careful enforcement of the ordinance prohibiting the throwing of broken glass and crockery, pieces of wire, nails and any old junk on the street. It hardly seems that the strewing of so much stuff of this character on the streets is due to simple carelessness. Much of it must have been thrown there with a knowledge that it is destructive to car tires. Cities that have no ordinance making this work a misdemeanor should pass one at once and make an example of the first offender. The wanton destruction of from $25 to $100 worth of property should not go unpunished.

The public has undoubted rights which car drivers are bound to respect, but suppose "the worm" now make a turn and let the careless or malicious portion of the public know that automobiles also have some rights that the public must respect.

CHAUFFEUR REQUIREMENTS.

A man is unwise to place a piece of property of from $2,000 to $6,000 value in the care of any one in whom he has not full confidence. And when that property may be destroyed by the slightest turn of a wheel or the movement of a lever, he should see to it that the man who is responsible for its care is neither heedless nor inattentive.

But when the owner's own life or the lives of others whom he holds dear are entrusted to the safe keeping of the man who cares for this property, as is the case of a chauffeur, he will under no circumstances allow the responsibility to be assumed by one who has not the most correct habits, the best training, and the highest character.

Those who are ambitious to be chauffeurs may well take note of this. The work not only requires proper experience and the best mechanical talents, but a keen and quick eye and a level head.

Be Sure and Get the Number.

Those who have never purchased a second-hand car from a dealer who has mislaid the records of the car cannot appreciate how difficult it may be sometimes to discover what the factory number of the car is. A case of this kind occurred last week, which, while it furnished some amusement and considerable instruction for those who knew about the matter but were not directly interested, proved not a little annoying to the searcher after a number. The purchaser of the second-hand car, which is an imported machine without an agency in this country, had not previously bothered very much about the factory number of the car, as there had been no particular reason to know just what the serial number was. When the new owner began making preparations to secure a registration for the car his troubles began, for the blank application to be sent to the Secretary of State's office has a line upon which the factory number of the car must be filled in. After a cursory search had failed to reveal the factory number, a more careful search of the car was made, but the factory number, without which no license could be obtained, was as elusive as ever. So the dealer who had sold the car was called up by telephone and asked what the factory number was. The dealer made search but could not find the papers which contained this information, but he was sure that Mr. Blank, the former owner of the machine, would be able to tell instantly. Mr. Blank's office was then called up, whence came the information that Mr. Blank was abroad and was not expected home for several weeks. No one in Mr. Blank's office knew anything about the car at all, not even the old State registration number, much less the factory number. Various concerns that make it a business to sell reports of registrations to automobile and accessory dealers were appealed to after the State registration number had been supplied by the Automobile Club of America's records of cars owned by its members, but none of these concerns could tell the factory number, though one offered to find it inside of two or three days. In this instance the difficulty was finally solved by an appeal to the Association of Licensed Automobile Manufacturers, which keeps all sorts of records, among them being the details of the original registration.

SOME NOTABLE RECORDS.

White Lowers Coast Record.—A new record from San Francisco to Los Angeles has just been set up by a 30-horse power White steamer, which made the 478-mile trip in 17 hours and 17 minutes, or 56 minutes better than the previous record, which had stood for over a year.

Records of an Elmore.—An entry in the Glidden tour will be the stock model Elmore two-cycle touring car which has been driven in every race meet, road race, hill climb, and endurance run in Southern California since it was shipped there. In the fifty-mile motor derby in Los Angeles it won the cup. It won the thirty-mile Lakeside motor derby race, carrying its full load, and making the thirty miles in thirty-nine minutes. It has run over 16,000 miles.

On High Gear Alone.—The Thomas-Detroit Forty Snowbird recently made a midwinter trip of 3,000 miles on high gear alone, with all other gears removed. On its trip the car went over the roughest roads, full of mud, snow and slush, in Michigan, Ohio, Kentucky, Indiana and Illinois.

Non-Stop Run by Oldsmobile.—An Oldsmobile has completed a 1,000-mile non-stop run in Seattle in the course of which it climbed the famous St. Ann's Counterbalance Hill on the high speed. In addition to the bonnet the officials sealed in the high-speed lever of the car. The elapsed time of the run was sixty-eight hours. Counterbalance Hill was climbed after the motor had been run twenty-six hours without stopping.

Mora Racetype Six Test.—The six-cylinder Mora Racetype, with seals intact and engine running perfectly, finished at Buffalo its sealed bonnet run of 1,000 miles in 47½ hours' running, or an average of better than 21 miles per hour, allowance being made for tire repair. Actual road conditions were encountered at all times, up and down the hills, through the towns, over unguarded railroad crossings, passing all kinds of vehicles.

Sealed Bonnet Contest.—The sealed bonnet automobile contest for silver trophies at Baltimore called out thirty cars of American manufacture, ranging from 12 to 60 horse power, which left the starting point at intervals of one minute each, to go over a course of 147.8 miles. Of the thirty cars that started seventeen finished in perfect condition within the time limit of twelve hours. Which of these are winners of the three cups offered is, however, undecided, and is likely to remain so. Those appointed on the technical committee to decide upon the relative conditions of the cars finishing with perfect scores seem not to have understood their appointment and none of them was on hand at the finish.

American and Foreign Cars.—The average speed of the winner at the Briarcliff race in a Fiat car was 49.25 miles an hour—up hill, down dale and stops included. Although a foreign car won, the average of the Americans was 44 minutes 22 seconds a lap, and that of the foreign cars 44 minutes 48 seconds.

Work of an Auto Truck.—The Logan Construction Company, of Chillicothe, Ohio, has made a test of a regular stock three-ton truck, delivering a load of canned goods in Cincinnati. One hundred cases were loaded in the truck and started from the factory, and that afternoon made a distance of thirty-two miles in about four hours. One bad washout was passed without difficulty. The next day the journey was continued to Dayton in the midst of a pouring rain, which made the roads very slippery. The start for Cincinnati was made next morning, and the sixty-two miles between that city and Cincinnati were covered in good shape, the truck arriving at a little before 6 o'clock P. M. Not a tool had been touched to the truck during the trip, and most of the way had been made on the high gear.

Another White Victory.—The White steamer won the run-off for the trophy for which four cars tied in the endurance run from Harrisburg to York and return, in the return from Philadelphia to Harrisburg in this year's sealed bonnet automobile run, and the same car is tied, as regards perfect road score, with the Thomas car for this year's trophy in Class A for high-priced touring cars. In Class B, for low-priced touring cars, the Maxwell won. The Pullman and the Rambler were on equally perfect road terms in Class C for high-priced runabouts, and in the baby class, that for the little runabouts, the Pullman apparently wins.

Fourteen Perfect Scores.—Fourteen automobiles finished the run of the Detroit Auto Dealers' Association with perfect scores. Fourteen cars which entered traveled in three days over 435 miles of Michigan roads, some of them wretched almost beyond belief, without losing a minute from the mapped out schedule or making any alteration or repair to their machinery. The winners were three Thomas-Detroit cars, one touring car and two runabouts, one Franklin, one Peerless, three Northerns, a Maxwell, a White, a Pierce-Arrow, two Oldsmobiles, and a Stoddard-Dayton.

LESSONS FOR DRIVERS.

Carelessness or Ignorance Is Responsible for Accidents.

As the season for driving came on the number of automobile accidents naturally increased, but so far as can be observed not a single one thus far reported was unavoidable. According to recent statistics compiled by the Travelers' Insurance Company, out of 167 cases of accident reported, 61 were due to cranking the gasoline motor. This seems singular, for without carelessness there is not the slightest danger in cranking. In our opinion, more accidents occur as a result of the use of alcoholic liquor than from any other cause, and the writer is not a temperance "fanatic" either. And what makes the matter worse, no car driver or car rider has the slightest need of the alcohol stimulant, however much or little others may need it. The driving and riding in themselves are stimulating enough for the most depressed or run down constitution.

Take the case of the recent fatality in New Jersey, by which a young man of eighteen years was killed. The proposition may be stated thus: A party of college students out on a Saturday night lark; "but (note the word as stated by one of the party) two or three drinks" had been taken by each of them; some chance girl acquaintances. These being the premises, it was no wonder that the results were terrific driving and final running into a house by the roadside with sufficient violence to shake it to its foundation, with one dead young man. Now if it had been a horse-driven carriage that they were using, but not going at one-third the speed, they would have been thrown out long before. So we don't see as there is any moral to be drawn from the sad affair except that it was a case of "sowing the wind and reaping the whirlwind." The automobile went exactly where it was guided and no faster than it was allowed.

And another rather prolific cause of car accidents is the new driver. He often does not seem to know that there is such a thing as inertia, centrifugal force or gravity. For illustration, a wealthy wine merchant of Williamsburg, N. Y., took out his newly purchased and powerful car for a ride. He swung around the street corner

with as much speed as should be used in a straightaway course. Of course the car skidded, and a man who had been standing beside the street was hurled twenty feet and killed. "Lightning never strikes twice in the same place," and it is safe enough to say that the driver will never have any more trouble from skidding.

Here is another case of skidding, and we give it just as reported. It appears that a man, his wife and son were riding at a good speed in San Mateo, Cal. Soon the car began to skid on the newly watered road. The driver placed his foot on the brake for an instant, and as the machine swung round he saw that it might overturn and released the foot-brake, steering directly for a tree and telegraph pole at the side of the road. He carried out his plan of action, but one of the tires on the rear wheel exploded, and the machine struck the tree and telegraph pole with great force. With the impact the machine tilted and threw the occupants into the road. They were all more or less injured, and the car was damaged $2,000 worth. The driver evidently was not aware that the utmost care and slow speed are necessary where the road is wet and slippery and winding, or inclining toward either side. In the case of a straight and level road there is little danger of skidding except in starting or stopping.

Accidents often occur, and sometimes very serious ones, by making a sudden turn when going at high speed, and causing a wheel to collapse. If the outside wheel strikes an obstruction it is pretty sure to take it off, and if there is no obstruction the centrifugal force is likely to either overturn the car or cause it to fly off at a tangent. In Kansas City, Mo., recently, a man was killed and two women badly hurt owing to an accident of this character. The car was going at a high speed when the driver found it necessary to suddenly turn to one side to avoid a street car. The rear outside curve wheel crushed over like an egg shell, the automobile hit the street car and the party was hurled out, with the result as stated.

An accident of a similar character occurred in East Orange, N. J., where, as near as can be learned, a sharp turn was attempted while going at a high speed, and a front wheel collapsed, throwing the six men occupants out. The ground was soft and they were not killed, although one was seriously injured.

Another instance of careless driving is where one car follows another at close range. If the front car comes to a sudden halt a collision is often unavoidable. This was the cause of an accident of a serious character in Philadelphia. Both automobiles were traveling at fair speed on Broad street when the forward one stopped suddenly. The rear car could not turn out nor stop soon enough and struck it with full force. The occupants were thrown out and injured and one car was wrecked.

A member of the Manufacturers' Association at considerable length warns automobilists of the dangers of grade crossings, and says such points of danger should be particularly protected on Sundays when so many cars are out. He adds: "I believe that I can consistently say that nine accidents out of ten can be attributed to the railway and not carelessness on the part of the driver of an automobile. It is deplorable that our tourists are not protected from death and accidents at the trolley crossings in the country. Every automobilist knows too well how grade crossings are left unprotected, and how many serious accidents have been averted only by rare presence of mind and quick wit on the part of the driver."

This is all quite true, but grade crossings are here, there and everywhere, and they are not likely to be abolished for some years. This being the condition, the only safe and wise course for car drivers is to bring their cars to a standstill before crossing any trolley or steam railway at grade. Any other course is simply the grossest kind of recklessness. Meantime, let the campaign for abolishing grade crossings continue.

Another source of perplexity and uncertainty for the car driver is the pedestrian dodger. No one who could be seen in the street or highway any distance ahead has ever been injured by a car if he or she kept right on without any change of speed. If they dodge back or spring forward, it is sometimes impossible to avoid a collision.

Taking a Tour.

In preparing for a tour don't load your car too heavily. At the outset a comfortable top and glass front are advisable. If you expect to drive fast over rough roads, by all means have your car fitted with shock-absorbers. A speedometer is almost a necessity.

Two new reserve tires should be taken. Flat treads are said to be best for the rear, but not for the front wheels, as they make steering rather difficult. Extra tires should be covered with waterproof casings. It is advisable also to carry two rear inner tubes and one front tube.

You should have a tire repair kit and a full set of tools, including a jack, and such spare parts as extra valves, valve springs, spark plugs and such small moving parts of the engine as are likely to wear quickly or break easily. Have the car equipped with good headlights, and if you travel at night never go faster than fifteen miles an hour in a strange country. The machine should always be kept under perfect control; half of the accidents that occur are due to careless driving.

Among the miscellaneous items that are needed, and which come in very handy, are a collapsible gasoline bucket with chamois strainer, collapsible water bucket, ammeter and voltmeter for testing the batteries, small electric flashlight to examine the car at night in the event of accident, and a dash clock. The modern touring car, properly equipped, is capable of railroad speed, but that is no reason why you should drive it at anywhere near such speed. The tourist who really wants to see the country through which he is passing and to enjoy a sensible ride rather than a mad dash against time would do well to plan his schedule on the basis of covering 15 miles an hour—or less, if he does not have a high powered car. This would be slow on the smooth, level roads, but where the country is rolling an average of 15 miles an hour is a good one, and to maintain it the car will be going at 20 and even 25 at many places.

Unless absolutely obliged to do so, do not do your own repairing. There will be mostly repair shops on the way; patronize them and save your own patience and strength. If you are out for a good time there is no sense in trying to squeeze every dollar and dime. Better stay at home than do that.

Use and Abuse of Tires.

One of the greatest enemies of rubber is its non-use. A tire in use will last longer than one which is "laid up." Most touring cars are put up for the winter, and while it is true in most cases they are jacked up off the tires, at the same time in most every case oil or some substance which is harmful to rubber comes in contact with it It dries out and as soon as the spring comes on and the car is put on the road the inevitable troubles commence. Many drivers, particularly beginners, apply the brake suddenly or start with a jerk, which is all wrong and not only one of the most severe strains on tires but on the car and engine as well. Others take corners with a sharp jerk with the clutch in, and this is another thing that quickly burns up tires. In taking a turn a good wide swing should be made and the car should be under sufficient momentum to allow it to coast around with the clutch out.

THE REPAIR SHOP

IGNITION SYSTEMS.

The Jump Spark and the Make-and-Break Types Carefully Compared.

BY J. C. DASSLER.

A large amount of the trouble that launch and auto enthusiasts have with their gasoline engines is due, directly or indirectly, to the "sparker," or igniter. In fact, the usefulness of a gasoline engine is largely dependent upon the reliability and effectiveness of its ignition. The other parts may be in bad working order, and if a good spark is made in the cylinder the engines will run, but let the spark even partly fail, and in the majority of cases the engine will stop. In general, the important requirements for an ignition system are:

1. The time of heating the portion or all the mixture must be accurately timed with reference to the position of the piston. This timing must adjust itself to variations in the load, the speed and the quality of the mixture supplied.
2. The heating must be effective; that is, the mixture or a portion of it must be heated to a sufficiently high temperature to cause an explosion with certainty
3. The action of the igniter must be certain and reliable.
4. It should be so arranged and designed that the apparatus does not interfere with the other parts of the engine nor absorb too much power from the engine.
5. The apparatus should not be expensive.

It will be seen that the really important requirement of good ignition is that it explode the mixture at the proper time and with certainty.

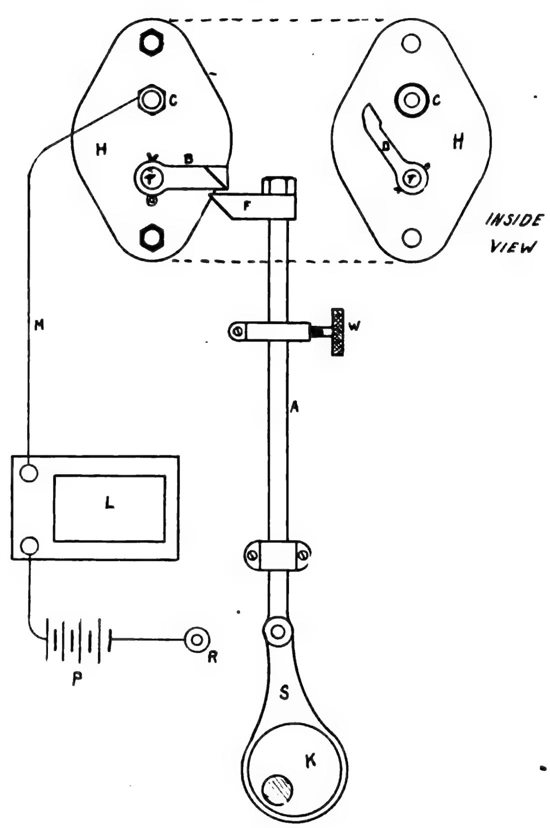
In the early gas engines various purely mechanical methods of igniting the mixture were used. But all proved so uncertain and so unreliable under varying conditions, and especially under varying loads and high speeds, that they were entirely supplanted by the hot tube method. In this system a portion of the mixture is allowed to pass into a tube (of porcelain, nickel, steel or similar fire-resisting material) which is kept hot enough by an external flame to ignite the part in the tube. As this method is still used, it may be well to describe it more in detail.

The tube is often located on the side of the combustion chamber, with one end opening therein. A burner for heating the tube, and some kind of a shield to protect it from blows and draughts, is also provided. The temperature of the tube is so regulated that when the piston has reached its upper dead center the charge has been compressed just enough so that the part in the tube will take fire (for the flashing temperature of the compressed mixture is lowered by compression).

In this system the time of ignition depends on the length, diameter, temperature and location of the tube; also to quite an extent upon the speed of the engine and the amount of compression of the charge. The proportion of air to fuel of the mixture will also vary the time of ignition. In practice the time of ignition is varied to suit the engine epeed, the quality of the mixture, and the load by varying the temperature of the tube and by varying the position of its hottest part. In some types a timing valve has been used that opens the tube to the mixture in the combustion chamber at a certain time, but it has been found that this does not materially improve the accurate timing of the hot tube. Although it is a rather difficult matter to so proportion and heat the tube that the time of ignition will be constant under varying conditions, and though they have been displaced by one of the electrical methods, still some of them are still in active service in places where electrical methods are unsuited for local conditions.

The most widely used method for the ignition of gas and gasoline engines is one of the electrical systems. In the last few years they have practically displaced all other methods, largely because of their adaptability to accurate timing. There are two general types—the make-and-

FIGURE I.



break and the jump spark. The make-and-break ignites a small portion of the mixture with the heat of an electric arc formed by suddenly breaking an electric current at the desired place. The jump spark causes a spark to be made between two terminals located in the mixture, this spark heating the mixture in its vicinity above the flashing point.

In the make-and-break system a low tension (low voltage) current, such as that obtained from an ordinary dry battery or storage cell, is used throughout the system, hence this is sometimes called the low-tension system. Figure 1 shows the characteristic parts of this system as applied to an American marine engine. Plate H is fitted on the side of the cylinder; A is a rod actuated by the eccentric S and cam K. The latter is mounted on the auxiliary shaft in the four-cycle engine or on the main shaft in the two-cycle type. On the upstroke of A the head F raises lever B, but on the down stroke F is arranged to pass by B. The lever or hammer D is fastened to the inside end of the same shaft on which B is

mounted—this shaft moving loose, but gas-tight, through the plate H. C is the stationary electrode—a rod so bolted to H that it is electrically insulated from it—carrying on its inner end a round head with a rim of platinum-iridium alloy. A wire, M, runs from this electrode to the sparking coil, L, which acts as a sort of intensifier, increasing the size of the arc made. This is a coil of many turns of insulated copper wire, surrounding an iron core. From here the circuit extends to the battery P, thence to a binding post or ground, R, somewhere on the engine frame. The engine frame carries the current from R to the movable electrode B.

The cam K is so adjusted to the position of the piston that at the proper time it lifts the rod A, thus raising B. This angular motion of B is communicated to D by the shaft T. D is so adjusted that it makes contact with the platinum ring on C, thus closing the electric circuit through the apparatus. An instant later the head F slips by B, and a spring quickly returns B to its horizontal position. But just before B has entirely returned it engages a slot in the shaft T, on which it is mounted. The momentum of this rapidly moving lever B sets the shaft and hammer D in motion and quickly breaks the electric circuit, thus producing an arc where the circuit is broken (between C and D). Timing is secured by properly locating eccentric K on the engine shaft. Also, the hand wheel W gives some adjustment of the time of ignition by moving the rod A back and forth, thus changing the time when F lets B drop. This control is very useful in adjusting the engine to quiet, efficient running under varying conditions, or to slow it down by making the spark late when the engine is in auto or marine use. The amount of heat generated for igniting the mixture is easily controlled by the size of the battery and the coil. By having a proper current a very hot arc can be obtained, sufficient for exploding any mixture in practical use.

The arc, of course, heats the points of the electrodes, hence they are covered with a heat-resisting, non-corroding, platinum-iridium alloy. The stationary electrode C can be turned around, thus exposing a new segment of the alloy ring to the hammer D in case the ring should become worn. As C is threaded into plate H this turning also moves the head of C to new point on D.

There is modification of this low tension system called the wipe spark that is in quite extensive use. In this, instead of the movable electrode hitting the stationary electrode and then being suddenly drawn away, the apparatus is arranged so that the movable electrode wipes or rubs over the stationary electrode before breaking contact. This obviates the expense of platinum contact points, as the rubbing will keep ordinary steel electrodes clean and free from non-conducting deposits of unburnt oil, etc. Otherwise the operation is the same as the make and break.

The jump spark system is very much simpler than the make and break from a mechanical point of view, as Fig. 2 shows. A battery Q is wired to the spring X, which presses on a commutator or contact maker on the shaft M—either the auxiliary shaft in the four cycle or the main shaft in the two cycle engine. When the metal segement P touches X a current flows from the battery through X, P, the shaft M and the engine frame to the engine ground B, thence by wire S to the primary winding of the induction coil, thence through the buzzer or interrupter on the coil and back through the wire S to the battery Q. This interrupter current going through the primary windings N of the induction coil induces a current in the secondary coil R of very high tension. This high voltage current flows through wire A to the center of the spark plug F. A piece of porcelain or mica E insulates this center wire from the engine cylinder till the wire is inside the cylinder, where the current can jump the air gap K, thus producing a spark in the mixture. The current returns through the engine frame to B, thence through wire A to the coil R.

Because of the high speed of electricity the spark is produced at practically the same instant the primary circuit closes. Therefore timing is only a matter of locating the metal segment P of the commutator relative to the position of the piston. By having the spring brush X movable about the shaft M, the time of the spark can be accurately timed relative to the piston. In practice this is known as advancing or retarding the spark.

All the jump spark systems are very much alike, even in detail. Practically all the plugs in use are similar to the one shown in Fig. 3, both mica and porcelain being

FIGURE-2

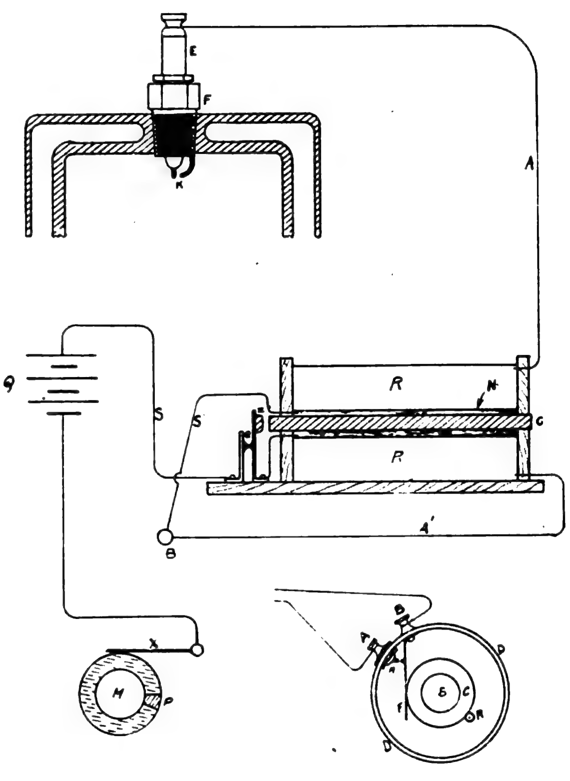


FIGURE-3

used as insulators. The spark coil consists of a soft iron core C wound with a few turns of heavy insulated copper wire for the primary coil N, and the secondary coil R of a large number of turns of fine, insulated, copper wire R wound around N. The interrupter is a spring with a small block Z of soft iron on one end so fastened that the spring holds the iron block Z a short distance from the iron core. When the current runs through the primary coil the core is made temporarily a magnet, hence it attracts the block Z, thus breaking the circuit at e. Then the core loses its magnetism and the block Z springs back to make remake contact with the platinum point at e. This is repeated so often that it hums, and hence the name buzzer.

The only real difference between the various jump spark systems is in the contact maker, or timer, as it is sometimes called. The timer shown in Fig. 3 is open to the objection that in the case of dirt or grease getting on the commutator there is a chance of the primary circuit not being closed, as this dirt may insulate the spring X

from the metal segment P. This is especially true when the timer is mounted on the main shaft of the engine. Therefore some contact makers are mounted on the end of a shaft, bevel-geared to the main shaft, and standing up alongside the cylinder. This removes them from the grease and dirt around the main shaft. They are often enclosed by a metal, glass-covered case.

In either system a small direct current dynamo may replace the battery. In this case a battery is generally used to start the engine, then cut out and the dynamo switched in when the engine has attained full speed.

There seems to be a general agreement as to the field of usefulness of electrical methods compared with mechanical. For high speed, variable load and intermittent running, such as in automobile and power boat engines and in many stationary engines, there is little doubt that one of the electrical methods is the most desirable. As to which of the two systems is the better there is very active disagreement that has not approached a settlement in the eight or ten years that they have been used. This fact shows that both systems are good, in fact, about equally good in most cases.

Because both the make and break and jump spark systems are good, practical systems, and especially because neither seems to offer any more advantages compared with its disadvantages than the other, it will be necessary to compare them piecemeal and in detail.

First Cost.—As to the cost of equipping the same engine with make and break or jump spark there is little difference. While the mechanical parts of the make and break are expensive, this is offset by the cost of the spark coil and other electrical equipment of the jump spark. In either case the same kind and amount of battery is required. The first cost is largely a matter of local conditions, still the jump spark seems to be the cheaper in most cases.

Maintenance.—The spark plug of the jump spark does not have a long life, therefore necessitating a continual expense for renewal. While this is the only part of this system that is liable to much wear with ordinary care, practically all the parts of the make and break are movable wearing parts, and therefore likely to wear out. This is especially true of the movable electrode and its accessories. As far as battery expense goes (that is, the quantity of electrical power required) there seems to be very little difference.

Conditions of Use.—The jump spark is best suited to the smaller, high speed engines. It will not work satisfactorily in any engine having a compression of over about eighty pounds per square inch. The make and break works best at lower speeds and under either low or high compression. It is best suited for the larger engines, such as are used in power service.

Power.—This is a much disputed question. The chief engineer of a large gas engine firm that uses and manufactures both systems says: "We never have noticed any difference between the jump spark and make and break so far as power goes." The differences noticed have probably been due to other factors, not to any inherent qualities of either system.

Reliability.—This question narrows down to the liability of accident and the ease of repair, for when in good working order both systems give good, consistent results in its own field. The make and break system has numerous levers, cams, springs, etc., requiring nice adjustment, and therefore liable to get out of order. There are few mechanical parts to the jump spark, and these are not likely to be disarranged. But, on the other hand, the electrical connections of the jump spark are more complicated. Also the high tension current used in this system is difficult to keep insulated, as it is very likely to "leak" on the least provocation, such as dampness or oil and grease getting on the wires. In both systems there is the chance of the electrodes becoming "sooted," that is, covered with a layer of unburnt carbon, whch makes a short circuit, hence stopping the spark or arc. While the make and break system will stand more soot without interference, yet it is more difficult to get at and clean. The jump spark also has the advantage that in case it should be thrown out of order it is much easier to repair without special tools.

Timing.—Both can be accurately timed. The jump spark offers in general a wider range of variation in the time of ignition, thus enabling it to be used as a speed control.

Simplicity.—The jump spark is more simple mechanically, but more complicated electrically, while for the make and break the opposite holds. Probably considering everything the jump spark is the simpler.

In General.—The hot tube would be used only where electrical devices were an objection because of some local condition.

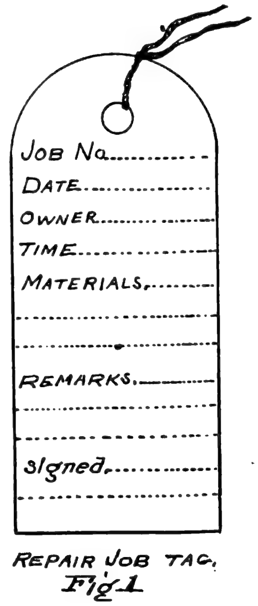
The jump spark is best suited for the smaller, lightweight, high speed, low compression engines, such as are used in automobiles and speed boats.

The make and break is generally better for the slower speed engines used in work boats, stationary power service, and the heavier class of autos. The make and break is considered the best for large engines.

REPAIR WORK.

Suggestions as to Price, Cost and Keeping the Account.

There ought to be a job tag used for every piece of repair work in the motor vehicle shop. Fig. 1 is a sketch of a form of printed tag which can be used to good ad-



REPAIR JOB TAG.
Fig 1

vantage. It will save a great amount of trouble. While the average owner of an automobile is well-to-do, there are many instances of "chewing" down the costs on repair jobs. The wealthy owner of a modern car often figures exceedingly close when it comes to estimating the repair work. In fact, there are some men who like to tell other machine owners how cheaply they have kept their machine in condition throughout the season. Other owners of machines are stingy, and oftentimes refuse to pay the costs on repair jobs, frequently cutting the figures regardless of the protests of the men who have done the work.

It is quite evident that there are many automobilists who do not realize the expenses incurred in making ordinary repairs. Often they will call for their machine after the repair job is finished, and find that a few new parts have been used, a patch made here and there, and a number of adjustments accomplished. They are not capable of comprehending the amount of time and labor which has been involved in doing the work. They see a few cents' worth of new parts and they wonder why the bill is so large. Therefore it is a good plan to have cards on which details of time and materials can be stated.

Some men will pay a bill without protesting, regardless of what the charges may be, taking it for granted that the

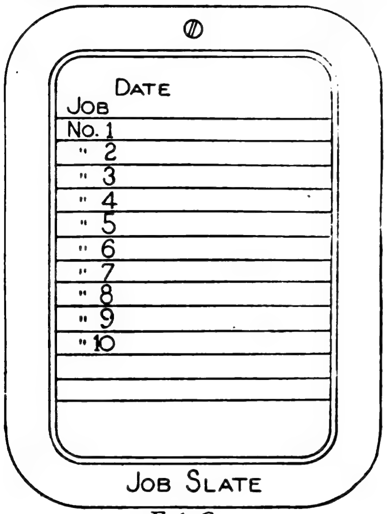
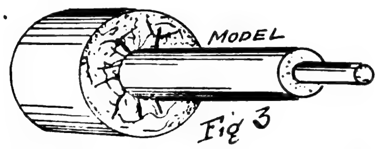


Fig. 2.

statement is correct. As a rule, repair men are honest. In almost every case the job requires more time and material than calculated, and when finished there is often not very much to prove that considerable time may have been devoted to getting the mechanism right. I know that many automobile repair men often put in extra hours on complicated jobs for which they make no charge, for fear of running the bill up too much.

Often "cranky" machines come to hand and the regular rules of adjustment fail to make the thing work. Strenuous efforts are taken to get some machines into running order. While repair men figure on charging from 50

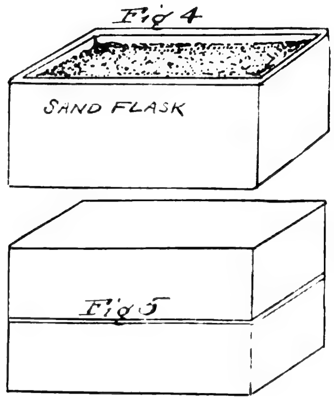


cents to $1 per hour for repair work, it frequently happens that the time runs on so speedily that the repair man hesitates to charge for all of the time. I know that very simple jobs often bother to such extent that several hours more than estimated are used in making the necessary repair. It might be one of the dollar jobs and it would hurt business to charge two or three dollars for it. I find that the automobilists are pretty familiar with charges for repair work. They know very nearly what it ought to cost to have a certain repair job done, and as soon as they think a shop is overcharging, they avoid that shop next time. A system of prices on repairs has been adopted in many shops. But with the ever-increasing changes in types of machines and parts of mechanisms, it is practically impossible to make permanent standards.

Every man is left to himself to make charges. However, the tag system will help. The tags can be printed on the order shown in the cut. The job can be numbered, dated, and the owner of the car written on. The amount of time consumed in making the repairs is written in, also cost of materials with itemized list of what the materials were. Then there is space for remarks. In order to keep the work straight, where two or more repair men are employed, each job bears the signature of the repair man.

There are shops in large centers in which the daily wages of the repair men are based on commissions on repairs. Hence the repair man doing the most work gets the larger return in cash for his services.

In some jobs a tabulated account of work is carried on a slate hung in the department, a view of which is given in Fig. 2. The slate is of the common school pattern. It is ruled off with lines scratched with an awl and



rule. The jobs are numbered and a new slate is used each day. That is, the work of the previous day is erased and the same slate employed day after day. At night the summary of the work is copied in the shop's account book. All jobs are numbered and it is easy to trace the same by the numbers.

Retained models of work are kept in some shops just as the dentist often makes a mould of the job he had done on your teeth, so as to retain a record for future use. Often the retained model of the part is made of wood and then cast. Or the part itself may be used as the pattern. For example, Fig. 3 is a part which it is desired to cast and retain. The common sand flask can be used, a view of which is given in Fig. 4. Moulding sand is kept in stock and ready for use. Fig. 5 shows the two sides of the moulding flask joined together. The composition for making the moulds is poured through the gate and the pattern is cast.

Use of Wrenches.

The force which is obtained when a ten or twelve-inch wrench is employed is far in excess of that which is needed for properly tightening a small nut, and it is a difficult matter to make proper allowance for this purchase so that the bolt shall not be twisted off. A good plan is to have at hand an assortment of solid or S wrenches, as these are designed so that their length will be proportionate to the amount of the strain which should be put on the nut they are made to fit.

New Dry Cells.

In putting new dry cells in your automobile never put in more than is required, which is from four to six cells for the average four-cylinder automobile, for a greater number than is required, connected in series, will not make them last longer, but, on the contrary, they will last a much shorter time, with no better results. This may seem queer, but the more cells the more voltage, consequently a greater amount of current flows, shortening the life of the battery and injuring the coil.

REPAIRS AND TOOLS FOR BEGINNERS.

A Few Simple Points as to Metal Turning and the Use of the Lathe.

Metal turning requires far more skill and care than wood turning. It is naturally very much slower, and the power required to run the lathe is greater; it may be anything from ¼-h. p., or even a man power, to 25-h. p. for modern lathes cutting with high speed tools. The tools for wood turning are held in the hand, but for metal work the hand rest is superseded by the slide rest, and on it the tools are fixed. In some lathes the tools are held in a bridle in the center of the slide rest. The objection to this is that the tools must be in one place, namely the center of the rest.

Often it is necessary to put a tool at the side. The tool holder should be of the type shown in Fig. 1, which is a plan. The center stud goes through a stout clamping block, which will swing in any direction; the wide end of this block carries two set screws which hold the tool. In

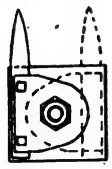


FIG. 1.—TOOL-HOLDER AND SLIDE REST.

the figure the tool is on the left, but by moving the block half a revolution the tool can be placed as shown in dotted lines, or in any other position desired.

The writer will assume the reader has purchased a lathe, but before he can use it he must get sundry appliances, bolts and plates to fix the work on the face plate. One or two carriers (Fig. 2) will be required, to hold from ¼-inch up to 1½-inches.

A drip can is a useful thing to have. Wrought iron or steel, when being turned, get extremely hot, and the tool would soon wear away, so soap and water is allowed to drip on to the work from a can which is rigged up on a

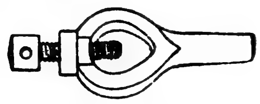


FIG. 2.—CARRIER.

stand on the saddle, with a tap and spout. A tray must be provided to catch the soapy water and turnings. The reader can easily fit up an old tin can with a small gas tap soldered in. It is best to put the tap not close to the bottom, but an inch up the side, then any turnings that may find their way into the can when the water is returned will sink below the tap and will not be so likely to choke it. Some dispense with the drip can and use a brush dipped in the soap and water to dab on the work. A few ounces of soft soap dissolved in half a gallon of hot water is the best lubricant to use; the soap prevents the water rusting anything it may touch.

The writer supposes that it is required to turn up a bolt, such a bolt as may be used for the hanger of a car spring. The bolt is ½-inch diameter and 4 inches long over all. The forged bolt has been received from the smith, or it may be turned down from a ¾-inch steel rod. If the bolt has been forged, it will be about ⅝-inch diameter. The first thing is to center it, either with a bell punch or by finding the center with compasses, or by running it round in V blocks (Fig. 3), and using the scribing block to find the center. Put the bolt in the V blocks, or even on the lathe bed, and with scribing block draw a line across the end, having previously chalked the end. Then turn it at right angles and draw a cross line; then again turn it half-way round, and where the lines intersect each other is the center; mark this with center punch. The other end must then be done. Place the bolt between lathe centers and run it round by hand to see if it runs true; if it is eccentric, find out which part is out of true by bringing a piece of chalk up to it while it is being run round; this will mark the eccentricity. The center

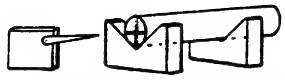


FIG. 3.—CENTERING WITH V BLOCKS.

punch must be used to draw the hole by making another hole on the eccentric edge of the old one, thus getting the centers right. The novice may find this a tedious operation.

When the centers are right, holes about ⅛-inch deep and about 1/10-inch diameter should be drilled with the hand drill. Care must be taken to see that the drill is in a line with the bolt. The carrier is then screwed on either the head or close to it, and a bolt or pin fixed in the face or driving plate to turn the carrier. The bolt is placed between the centers. The poppet head center must be oiled, and will require tightening up again after the lathe has begun at work.

If the lathe is a very small one, the back gear may be used, a side-cutting tool clamped in the slide rest and brought up to the work by the handle on the rest. As the skin of the metal is generally harder than the inside, the first cut should go right under the skin. As the work proceeds, the callipers should be used to see that the lathe is cutting parallel. If it is not, it may arise from one of two causes—either the tool is getting blunter and wearing away, or the slide rest is not parallel with the lathe centers. Many lathes have an adjusting screw under the head stock to bear against the lathe bed. By turning this screw the lathe head is forced to one side or the other. If the mandril and poppet head center are not in line the lathe cannot turn parallel.

If the bolt is rough the last cut may be taken with a tool that has more bearing on the work, and it must be a very light cut, only taking off a little metal. For this a tool (Fig. 4) for cutting iron may be used; it will also be required for working out the corner of the head. Before taking the bolt from the lathe a file mark should be made to show how far it should be screwed, and if this is cut with stock and dies, that part of the bolt should be turned a little less than the rest, say a bare 1/32-inch, for the dies force up the metal besides cutting it.

The novice will notice that a rod which has been turned just to pass through a hole will not do so when a thread has been cut on it with stocks and dies. Turning down the part to be screwed also lessens the labor of screwing.

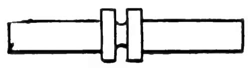


FIG. 4.—TURNING PINS.

In turning up pins such as are used for the steering gear of a car, if two are wanted the best way is to turn them out of the same rod. Cut off the rod 3/16-inch longer than the two pins, turn them up, the two heads in the center, then with a parting tool cut them partly in two. It is best not to cut them entirely apart in the lathe, unless the turner can thoroughly trust his tool, for parting tools sometimes dig in and bend or break the work; besides, the pins are more easily held in the vise for screwing than if they had been previously cut in two, also they will be more easily held for drilling the holes for

the split pins. When this is done they can be cut in two with the hack-saw and the heads filed down. If steady pins should be fitted in the heads to prevent them turning round, these must not be forgotten.

There are many cones, so that it is important to know how to turn up a cone.

If a new half crank shaft is wanted for a motor cycle, the parallel part should be turned up first and the cone examined to see what is the amount of taper; a template of tin plate should be cut to this taper. It will be noticed that the slide rest is secured to the saddle of the lathe by a circular plate. In this there are two segmental slots, and by loosening the nuts on the two bolts which pass through the slots the upper part of the slide rest can be swivelled to right or left, so that it will cut at an angle with the lathe centers. Having got the slide rest as near as possible to the proper angle by the template, a piece of soft iron should be turned down to the taper of the cone and tried in the cone of the fly-wheel. It is almost sure not to be at the proper angle at the first attempt, but by smearing it with thick paint or red lead and turning it round two or three times it will be easily seen at what part it bears. The slide rest must be again adjusted till it cuts away the high part and the iron bears all over without any shake. When the proper angle of the slide rest is found the steel crankshaft can be proceeded with. It is well to note by a punch mark on the rest the actual angle of the cone for use at any future time.

If in turning the steel cone the smaller part is towards the lathe head stock, the same position of the slide rest will do for boring a taper hole in a fly-wheel, so it is best to have both iron and steel long enough to take the carrier; that on the steel can be cut off afterwards. Fig. 5 shows the arrangement for swivelling the slide rest.

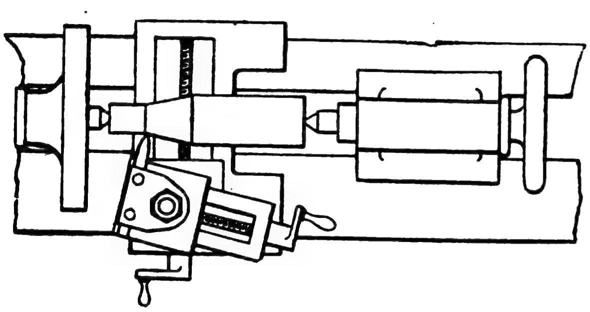


FIG. 5.—CONE TURNING.

The reader will see that the lathe cannot cut truly parallel unless the slide rest is parallel with the centers and the swivelling of the rest will allow it to be correctly adjusted.

In turning cast iron the metal must be dry—soap and water are not required; but the skin of cast iron is very hard. It is even more important to get under the skin at first cut than with wrought iron or steel.

Brass turning is easier than iron; water is not required. Cast brass has a skin which must be got under at the first cut. The tools for brass should be of a finer edge than iron. Brass can be worked at a higher speed than iron. Copper can be worked at a still higher speed; water, but without soap, should be used for copper.

The "Practical Engineer's Pocket Book" gives the following speeds for lathe work:

Wrought iron..........	25 to 40	ft. per minute.
Steel	20 to 25	" " "
Cast iron..............	15 to 20	" " "
Gun metal.............	20 to 40	" " "
Soft brass.............	40 to 100	" " "
Wood	1,000 to 2,000	" " "

But the writer has found that gun metal can be cut at a much higher speed.

The lathe man should form some idea of what the speed of his lathe is. Eighty strokes per minute seems a fair average speed for treading. If the larger V pulley on mandrill runs as 1 to 5 with treadle shaft, the lathe will run 400 revolutions per minute on a diameter of 1 inch. As this is more than double the speed as given above, the back gear must be used. If the back gear reduces the speed from 10 to 1, a very usual ratio of gearing, the belt must be put on the higher speed of the V pulleys, otherwise an object 1 inch in diameter would only have a speed of 10 feet per minute, much too slow for useful work. In turning some objects, although the speed when running without the back gear may not be too great, the effort of treadling is so excessive that it is necessary to use the back gear.

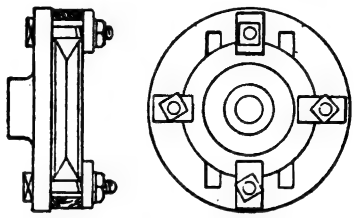


FIG. 6.—FACE PLATE WITH PULLEY.

Hitherto the writer has only considered turning between centers. For boring and turning disc-like objects a face plate or chuck must be used. For use on the face plate the reader must procure some bolts that will pass through the holes and slots of the face plate. Most small lathe face plates will take ⅜-inch bolts. The bolts should be of varying lengths. Some can be as short as 2½ inches, in other cases 4 inches or even longer bolts may be required, but the bolts by themselves would not hold the work on the lathe unless the job happened to have holes that corresponded with the slots in the face plate, so plates must be provided. A piece of 1x⅜ inch bar should be cut into various lengths—for instance, a pair of plates 2 inches long, another pair 3 inches and another pair 4 inches. In the shorter plates a 7/16-inch hole should be drilled not quite in the center, but about ¼-inch to one end; the 4-inch plates should be drilled with two holes to correspond with the slots in the face plate.

Suppose a small pulley has to be bored; it is too big to go in the self-centering chuck, so it is bolted on the face plate by means of the bolts and plates. Under the tail end of each plate must be put a packing of metal or hard wood; one end of the plate bears on this and the other on the work. (This is shown in Fig. 6.) In the left hand side view two bolts only are shown, but all four in the front view. It is best to bolt the work on when the face plate is in a horizontal position, and to tighten the bolts slightly, and then place it on the lathe. The work must then be centered by tapping with a light hammer till it is in the right position, when the bolts must be tightened. The writer prefers square-headed bolts and nuts for lathe work, as they are more easy to catch in the spanner.

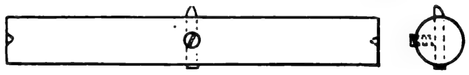


FIG. 7.—BORING BAR.

There are two methods of boring. One is described above, where the object is bolted on the face plate or held in a chuck, but this method is not suitable for any long object. For boring in the lathe a boring bar must be used (Fig. 7). It is well to have several of these if much boring is likely to be done, of sizes of 1 inch, 1½ inches

and 2 inches. The boring bar is simply a rod of iron with centers; it is not absolutely necessary it should be turned all over, but it should be turned for ½-inch on each side of the cutter hole. The cutter hole is a hole ⅜-inch diameter drilled through the bar to carry the cutter, which is practically a lathe tool, only made from round steel, not square. Several cutters will be required of different lengths. The cutter is kept in place by a set screw, which bears on the upper side of the cutter, on which a flat has been filed. This screw keeps the cutter in its plate; when it is wanted to advance the cutter, it is tapped on its end with a hammer.

Referring to the bush, the casting must be bolted on to the saddle, the slide rest being removed. On the saddle will be noticed four or more slots or holes for square-headed bolts. These bolts should be got ready and tried in the holes beforehand, for as in many lathes these slots are very shallow, the bolts may require some fitting to go in. The bolts should be at least 1 inch longer than the swing of the lathe—for a 3-inch lathe they should be 7 inches.

The casting is bolted on to the saddle, held up by two V blocks of hard wood and two to clamp down on them (Fig. 8). If the center is too low, the casting must be packed up by putting strips of metal under the V blocks.

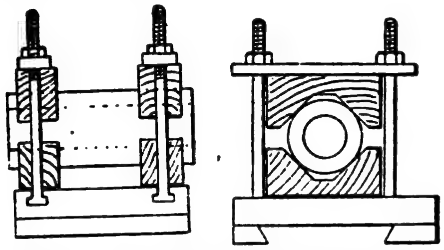


FIG. 8.—BUSH IN SADDLE FOR BORING.

The centering requires some care. A bent scribing wire can be put in the cutter hole and wound round one end to see if the casting is central, then the other—centering one end will often throw out the other—and the work must be done over again. Chalking the ends so that the scriber marks show plainly facilitates the work, but it often takes longer to center the work than to do the boring. When central the cutter can be put in, and the saddle being worked by the traversing gear of the screw-cutting arrangement, a cut is taken through. The traversing gear is the slowest movement the wheels will give to the screw. The wheels to use will be found marked on the table of change wheels. The saddle should start from the poppet head end and work to the head stock. When the first cut is through it must be carefully callipered to see if the bore is parallel.

It will probably be found to be considerably less at the finishing end, owing to the tool having to encounter the hard skin of the brass, and it has become worn. Then another cut must be taken through, a very light cut at the start. This should bring the hole fairly true. If it is near the size, the finishing cut may be taken; this should remove as little metal as possible, so as to give the tool but little work to do; for the finishing cut the tool must be reground.

Spark Coil Adjustment.

To adjust the spark coil remove entirely the vibrator contact screw and adjust the vibrator spring so the hammer or piece of iron on the end of the vibrator spring stands normally about 1-16 inch from the end of the coil magnet. Then screw in the contact screw until it touches the platinum contact on the vibrator spring—make sure it touches but does not bind. Now start your engine; if the engine misses at all, tighten up the contact screw, just about one-sixteenth of a turn, or if notched, just one notch at a time, until every cylinder fires. If your winding is in perfect condition, the coil will give quick action and good spark with very little consumption of battery current. When buying a coil insist upon having a standard make; there are coils made which take an enormous amount of current, and high-grade coils will save their cost in one season on the saving in batteries. You should always have a coil current indicator and be positive about your adjustments and pull the least possible amperage to obtain the required spark for ignition.

MOTOR CAR PAINTING.

Durabilty Is the Master Stroke, and How This Is Secured.

BY M. C. HILLICK.

To the painter engaged in the business of motor car repainting, the master stroke of success is durability, however important other details may be, and in the last analysis his reputation must stand or fall by the verdict rendered through the unmistakable testimony of this supreme essential.

Other virtues endure for a season and pass away, but durability is the standard by which men arrive at definite conclusions and upon which they base opinions worth while to the painter. In repainting the workman is called upon to work over surfaces concerning which, in many cases, he knows little. The car, for example, comes to the shop showing little of the disease actually afflicting the structure of paint and varnish, and this condition remains undisclosed during all the processes applied to it as it journeys through the paint shop.

Sooner or later the weakness manifests itself with circumstantial evidence pointing directly to the painter as the chief culprit, whereas the party responsible for the prior painting of the vehicle should be held accountable, barring, of course, the responsibility which attaches to the failure to unearth the existing defects. However, cases are rare where a thorough examination by an experienced painter fails to reveal some suggestive details of the ailment. It is therefore a step of the first importance upon the vehicle's entry to the shop to first make a minute inspection of the surface throughout, and this inspection with whatever data it may disclose should be carefully and systematically entered into a journal kept for the purpose.

To the fullest extent possible consistent with the price received for the job, this surface condition should govern the processes of work applied, a practice too often, unfortunately, omitted altogether.

The surface that shows a fractured or scaly condition, even in the smallest part, may well be examined with more than ordinary vigilance. Over such a surface weakness no paint or other material should be applied until under exhaustive soundings and microscopic study it is found that the paint and varnish is soundly intact. Not infrequently it will be learned that an ordinary appearing surface fracture, splitting the paint and varnish fabric without apparent injury to adjoining parts, is beset with danger to a wide sweep of surface, having practically unseated the paint structure directly to the wood.

To paint and varnish over such threatened surfaces is to cast away all precaution and deliberately ignore the basis of durability. For in these latter days, and profoundly in these days of art in motor car painting, durability rests primarily upon establishing a sound and sure foundation.

The uses of durability, in fact, are not best served by

great skill and an infinite capacity for taking pains in applying the material, but rather by a thorough-going and expert method of preparing the surface to receive whatever coats of material it is elected to apply.

The policy of many of the best motor car painters in New York, and, for that matter, in other cities both East and West, is to first work the surface down to a condition as clean and hard as the historic tooth of the hound. This may be accomplished by steel scrapers, the gasoline lamp, or with sandpaper of various sizes, or with a combination of all these mediums.

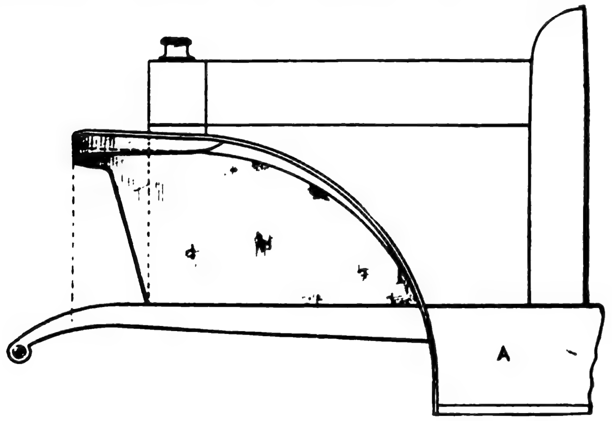
To be sure, when the vehicle comes in for a mere touching up and a coat of varnish the case is different, and provided the owner is enlightened as to the exact condition of the surface, the cracks and fissures are not to be effaced beyond what the regulation flow of varnish will succeed in doing. More exhaustive surfacing processes will carry the work out of the class of the touch-up-and-varnish jobs.

Naturally all these diligent and complete surfacing processes go for naught unless the best materials are employed, and applied by a high grade of skill. Poor materials, to the same extent as inferior help, are a curse to the user, even though quoted at a figure which fairly suggests a free gift. In the exacting field of motor car painting it pays to buy the best in the market, because in no other way may we insure the desired durability.

MUDGUARD IMPROVEMENT.

How It May Be Done at Small Cost and Will Save the Paint Work.

Efficient mudguards are not, as a rule, things of beauty, which probably accounts for their not being fitted in many cases. However, the ordinary type of mudguard can be temporarily improved at quite a small cost in the way we here suggest, and the additional parts can easily be removed when necessary. The improvement consists in filling in the side of the mudguard next the bonnet in



the manner shown. The material used can be patent leather, which, however, is rather expensive, in that it takes almost one whole hide for each mudguard, at a cost of somewhere near 10 shillings. As a substitute, some composition material having the appearance of patent leather can be used, but this is not as durable as leather. However, its appearance is good. The cheapest material, probably, which is at the same time efficient, is tarpaulin, which can be obtained at most oil merchants.

It is advisable to make a paper pattern first, allowing enough material to turn over the top edge. A few one-sixteenth-inch holes can be drilled in the edge of the mudguard and the material attached by copper wire, bifurcated rivets, or, preferably, small bolts and nuts. At the bottom the material can be attached to the bonnet boards with tintacks, but straps are better. This effectively prevents mud finding its way through on to the bonnet and dash, but it does not prevent mud coming over the front or the side of the guard, which it does at high speeds. To stop this a strip or rim should be allowed to extend across the front and down the outside of the guard, as illustrated.

If this is done it will be found that no mud will come over or around the guard on to the car, but it still will be thrown on to the radiator, which can be prevented by carrying the material down along the dotted line as far forward as possible. If this is done, and the space A between the frame and the step boards filled in, in the illustration, practically no mud at all will reach the body from the front wheels. Very often the back mudguards are provided with flaps inside to prevent the mud from the rear wheels being thrown on to the bodywork. In the case of a two-seated car this is absolutely essential, as otherwise the whole of the rear sloping box becomes covered with mud in a few minutes. Even on a four-seated car it is preferable to fit these flaps to save the paintwork.

WHY IT OVERHEATED.

A Prolonged Difficulty Due to Lack of Gasolene at the Carburetter Jet.

The engine was a twin cylinder and had never run well from the day it was first started. The symptoms were that it was rather hard to start, and that soon after starting it ran very hot. By night the valve box glowed visibly, the valves rapidly pitted so heavily they needed turning true in a lathe, the exhaust valve spring lost its temper altogether within a hundred miles, and so on. These symptoms are common to overheating from many causes; the remaining symptoms provide the clue to the true solution. The carburetter might easily have been supposed to be accurately adjusted. The engine was more or less responsive to both throttle and extra air levers, started with the extra air shut off, and accepted almost the whole of the extra air when running fast. If either the air or throttle lever was at all carelessly moved, that is to say, with a swift swoop of the hand, or over a large portion of the quadrant, the engine promptly stopped firing, and had to be restarted with the handle. A total cure was effected by simply adjusting the carburetter float balances on the float needle at such a height that when the engine was stationary the gasolene stood in a bead on the top of the jet without brimming over.

These curious phenomena are simply explained as follows: The suction of the engine had two functions to perform under the original adjustment. One was the normal function of taking fluid gasolene from the tip of the jet and atomizing it, added to sucking in air through the orifices provided in suitable proportions. The other was the abnormal function of sucking up gasolene through a very fine tube. This second function demanded more suction evidently than one might be inclined at first sight to believe, and owing to most of the suction being wasted on the air orifices, the suction could not be relied upon to bring up the fluid gasolene in the jet, and so the engine was difficult to start. As soon as the engine was successfully started, a second trouble came into being. After cranking the engine round, the driver naturally leaned over to the levers and provided a little extra air. This threw open other orifices upon which the scant supply of suction promptly wasted itself, and as a result no fluid gasolene appeared any longer on the tip of the jet, and consequently the engine stopped. The driver then restarted the engine, imagining he had been a trifle too generous with the extra air, and both in controlling

the engine to run light and under load he became very stingy with the extra air, knowing the engine was ultra sensitive, and would stop if he advanced his levers a notch too far along the quadrant. Consequently, he fell into a habit of running on far too rich a mixture, and the bogey of overheating held wild and constant riot under the bonnet, until the engine became so enervated it could run no more.

This experience shows in deep relief the necessity of getting the level of gasolene flush with the top of the jet, and the necessity of verifying this point when the float needle has been ground in after long use. It is unsafe to test the point with the carburetter detached and propped up on a bench, as few carburetters are set dead level on the car. Fortunately, the top of the jet can generally be exposed without removing the carburetter, and thus the level can be tested as it is. It also suggests that it is wisest to set the carburetter with its two chambers athwart the car, as opposed to longitudinally, and that if they cannot be set athwart, the float chamber should be in front of the spray chamber rather than behind it if the best results in hill climbing are to be attained.

Look Out for Short Circuits.

Batteries are frequently condemned for becoming exhausted too quickly when the trouble is due to a short circuit. A common cause of short circuiting lies in stray strands, of which most wires are built up, coming into contact with metal parts which should not be touched by the wires. Very often, when placing a wire under a nut or around a stud that is insulated from the rest of the metal, one or two of these minute strands will not be secured, and shortly will vibrate or be jarred against the machine in such a manner as to permit of a continuous flow of the current, with the result that the batteries will be quickly exhausted. If care is taken to secure the wire properly this form of battery complaint will be done away with. A quick method of testing a short circuit in the primary connections of an ordinary jump spark ignition system is to apply a voltmeter across the terminals of the entire battery while the commutator is standing at one of its neutral points. After observing the reading of the instrument, the cutout switch should be thrown back and forth several times. If the circuit is perfectly insulated, there will be no difference in the reading under these circumstances. If a short circuit or a ground exists, however, the needle will fluctuate, as the open circuit reading is always higher than when the circuit is closed.

A Flexible Spark Plug Wire.

Owing to the vibration of the wire, the second terminal of the spark plug often breaks, and this is decidedly unpleasant if it occurs when far from a repair shop. A simple and very effective way of obtaining a good contact, and yet securing one that is absolutely flexible, is by coiling a fine brass spring wire around a lead pencil, making a spring three or four inches long. The end of the coil spring thus obtained may be soldered to the secondary wire and the other end of it either soldered to a terminal or shaped to meet the requirements of the spark plug. The result of this is to obtain a flexible end that will permit of any amount of vibration and will not offer sufficient resistance to cause the wire to break.

A Fractured Crank Shaft.

Crank shafts are better than they once were. But even now they sometimes break. In one case where one was fractured through the crank-pin owing to a defect, it was repaired in 20 hours in this way: The crank-case was disconnected and the crank-shaft was placed in its bearings in the case, and the connecting-rod and its brasses were bolted tight onto the fractured pin. Two forked straps and four bolts held the webs of the cranks together, while it was drilled and reamered out smooth and parallel to one inch. A good, mild steel pin was turned to fit the hole, driven in tight, and rivetted over at each end. The reason it was repaired in this manner is because the makers could not deliver a new crank-shaft in a sufficiently short time. The motor has since run well, without any signs of giving out.

REPAIR BILLS.

Car Owners Know Little About the Cost of Running a Shop.

Many car owners feel that in settling a repair bill they are suffering an extortion. Although this is true in some instances, it would undergo a considerable modification if the owners were able to see behind the scenes of such a business for a long enough period to grasp some idea of the unavoidable expenses of running a repair establishment.

Many causes conduce to this state of affairs, the diversity of the work with which a motor mechanic has to cope being not one of the least. It is one thing to turn out in hundreds consecutively a given part of an automobile by means of automatic machinery. It is quite another thing, however, to be suddenly called up to make one or two of the said parts exactly to match in a desperate hurry with the ordinary plant of a repair shop. Very likely a less urgent job has to be temporarily abandoned, a special tool made and the article itself produced out of the nearest size piece of material at hand. This material may be a piece of phosphor-bronze or cast steel bar, considerably larger in diameter than is really necessary, but neither time nor the expense of obtaining something nearer will warrant the repairer doing otherwise than paring down at the cost of extra time and waste of material what is ready to hand. It is all very well to say that repairers should carry a stock to meet all contingencies; people who babble thus have not the faintest idea of the cost and diversity of such a stock.

Then again comes the loss through having to scrap faulty castings or pieces of steel that are cracked or warped in hardening after a lot of expensive labor has been used on them. Who is to stand the expense of all this? It is impossible to charge it to the owner of the car, for it is no fault of his. If it is a casting which is found to be useless on account of being spongy or having blowholes, the most that the foundry will do is to allow, with more or less bad grace, scrap-metal price for the casting or to replace it free. But there is the labor lost.

A Leaky Radiator.

Where a leaky radiator is of the cellular type it is not easy to repair. As a rule the leak is very minute and the water works its way along the many small ridges until its source is lost. If the leak is of a pin point size it can be temporarily fixed on a pinch at any point along the road—as well as in the garage—by inserting a handful or two of bran in the radiator. Sawdust has been known to cure leaks, but it has the fault of sometimes packing in the pump, to the detriment of that part of the cooling system. Even when bran is used if there is a pump in the water circulating system it will be well to look at the pump after the leak has been stopped to clean out any deposit that may have collected.

If you find what you want here, please tell your friends about it.

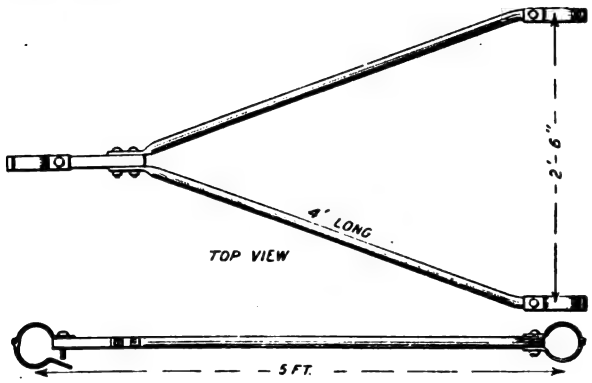
TROUBLE DEPARTMENT.

Under this head are questions and when possible, replies to them. Our readers will appreciate the importance to inquirers of furnishing the desired information promptly.

This department is intended to be a "trouble clearing house," and it will be esteemed a favor if our readers will add information to it from their own experience or knowledge.

A Car Trailer.

From E. C. Greef, Iowa—I inclose herewith a sketch of the best trailer iron I ever saw or had. I had one made recently like it. The trailer holds both ways, turns cor-



SIDE VIEW

ners and is absolutely safe. No more ropes for me for this work. I wrap the axles with burlap to prevent rubbing, and separate the parts to carry handily. The sketch shows top and side views.

For Stopping an Engine Leak.

From Schnoor Brothers, Laurel, Iowa.—I send you something that may be valuable to help those having trouble with keeping water cooled engines from leaking between the head and the cylinder: Scrape both head and cylinder clean. Then if you use asbestos packing with wire in it, use one layer with a good coating of red lead on it. If you use the plain asbestos, take two layers of it, well coated with red lead. Put packing on the head first, then slip over the studs and tighten. Run the engine without water until warm and then tighten the bolts or studs again. If the above is followed, you will have a good job.

Flat Treads and Studded Cover.

From N. M. P., New York—To "A Sufferer," Washington, I would say that studded covers are all right on bad roads in cold weather in winter, but in the summer time the heads of the studs burn the fabric of the inner tube. So after using them I found my tire bill double. "Sufferer" is informed that they are dangerous on asphalt in the city, for they do not prevent skidding on such streets, and they are useless on car tracks. I am in favor of the flat racing type tread, which is less expensive and offers plenty of surface to the road or street.

A Cylinder Misses.

From N. M. P., New York—I have a 24 horse power car which has run 10,000 miles. I have had no trouble with it except in the case of one cylinder, which has always been missing fire more or les, but of late it seems to miss at all times. My carburetter is perfect; my wire is good and my magneto is in good order; the compression is perfect, as are also the valves. I would be very glad of some opinion as to the cause of the trouble with the cylinder.

A Vulcanizing Query.

From W. B. M. (no state or town given.)—I am using a small vulcanizer to close some cuts in my tires. I am doing the work while the tires are on the wheels and fully pumped up. Do you think the heat will affect in any way the inner tube, or should the tires be taken off while doing this work?

Reply—The inner tubes should be taken out for vulcanizing cuts in the casings if the cuts are deep and require much heat. Otherwise the heat is likely to make the inner tubes stick to the casings so it is impossible to remove them.

Raising the Gasoline.

Not long ago, while out motoring on a car which was gravity fed, we came to a long, narrow, steep hill. The gasoline failed to reach the carburetter. To turn round was impossible, and to back down and go up backwards was undignified. The cup at the top of the gasoline tank had fixed to it a small horizontal piece of brass tube in place of the air hole. On to this was slipped a piece of indiarubber piping used for the lamps, and by blowing down this the car was temporarily made pressure fed, and so we sailed away without any difficulty to the top of the hill.

To Get the Radiator Cap Off.

Radiator caps sometimes develop a tendency to stick. When this occurs, it is not necessary to force off the offending member by means of a cold chisel and hammer, or to apply that prevalent abomination, the pipe wrench. Instead, by winding a piece of chamois leather about it and twisting the ends tightly together a sufficient grip may be obtained to loosen it in almost every case. Do not screw the cap on too tightly when the radiator is hot, as otherwise it may tend to set when cold and give trouble.

A Nut Lock.

Without a lock washer or regular lock nut, it is possible to secure a substitute by using two plain nuts screwed together with a little waste between them. After setting home the first nut, the thread of waste should be twisted around the bolt, close to it and in such a way as to embed it in the roots of the screw where the second nut is to come. This simple form of packing frequently lasts for a surprising length of time, and provides sufficient resistance to hold both nuts against any ordinary amount of vibration.

If you don't see what you want, ask for it.

TWO USEFUL MACHINES.

The illustrations show an 11-inch lathe and 20-inch drill press made by the Rockford Drilling Machine Company, of Rockford, Ill. The lathe is an exceedingly stiff and well-constructed tool. The bed is of ample proportions and is well braced to give strength and rigidity. The head and tail stocks and carriage are fitted to the bed with a V in front and a flat bearing in the rear, a construction which insures accuracy. The V ways are of large size, giving long wear. The head stock is stiff and strong and is held by bolts screwed directly into the bed. The spindle bearings are large, with boxes of phosphor

Rockford 11-inch Lathe.

bronze. The spindles for both head and tail stock are made of a high grade steel and are accurately ground to fit. The carriage has broad bearings on the legs and is thoroughly gibbed and can be clamped to the bed for cross feed work. The carriage is fitted with T slots clamping on the work. It has right and left power feed, both longitudinal and cross. It is equipped with compound rest, the base of which is graduated. The tail stock is offset to allow the compound rest to be set parallel with the bed and has a set-off adjustment for taper work. The rack and spindles are cut from steel, the rack being in one piece. Translating gears or metric lead screws may be provided for cutting metric threads, if ordered.

The drill press illustrated is of sufficient size to drill to the center of a

Rockford 20-inch Drill Press.

20-inch diameter and can be equipped either with plain lever feed, wheel and lever feed or power feed with automatic stop and with or without back gearing. These two machines would make an economical and ideal equipment for small repair shop for automobile work.

REVOLVING AUXILIARY SEATS.

Those who are looking for a seat that will increase the seating capacity of their car will be interested in the one brought out by the Graves & Congdon Co., of Amesbury, Mass. They claim it is made 'pon honor, so to speak, and of the best materials. It can be removed without the use of any tool or even the unfastening of a single catch, by simply one easy movement of

Seat with Back.

the hands, lifting up on the seat, leaving behind no unsightly or objectionable projection, but simply a plain slot, of wedge-shaped taper, which serves to hold the seat bracket, only the more firmly, the greater the weight brought to bear upon the seat.

This seat does not have a sliding motion, but revolves upon the bracket which supports it, so that the occupant can face in almost any direction which he chooses. The seat, when folded, can be revolved, so that its back will come to the side of the car, in which position it stands out only about 6 inches from the side of the car, or if

Folded Seat with Back.

preferred it can now be removed from the car entirely by lifting it out of the dovetailed slot.

The seats are made in two sizes and both with and without backs. In ordering, give the name of the car, grain of the leather used in upholstering, and if possible, a sample of the leather. This being done, a perfect match may be had. For further particulars, address the manufacturers, Graves & Congdon Co., Amesbury, Mass.

A FINE CATALOGUE.—If the Stewart & Clark Manufacturing Co., manufacturers of the Stewart Speedometer, know how to make speedometers as well as they know how to make catalogues, then no one can excel them. To look at the illustrations in this catalogue is the next thing to taking the instruments themselves in the hands, and nothing is omitted to clearly show everything necessary to any one interested. And the catalogue is as pleasing to the eye as it is admirable in a mechanical sense. Evidently this firm believes that whatever is worth doing at all is worth doing just as well as it can be done. As to the Stewart speedometer, it speaks for itself in the catalogue. The firm will send one of these catalogues to any one interested who will write for it and mention THE AUTOMOBILE DEALER AND REPAIRER. The address is Stewart & Clark Manufacturing Co., 502 Diversey Boulevard, Chicago, Ill.

A NEW ROAD MAP.—An excellent and accurate road map of southeastern Michigan has just been brought out by C. S. Mendenhall, the well-known map publisher. This map is a complete guide for the motorist to all the territory around Detroit, and takes in that portion of the state extending north to Bay City and west to Lansing—an exceedingly populous and interesting section, comprising many delightful rides. This map is a marvel of completeness. It is folding for pocket use and retails for $1.50. For this map or that of almost any other touring route address C. S. Mendenhall, 39 Opera Place, Cincinnati, Ohio, and mention the AUTOMOBILE DEALER AND REPAIRER. Mr. Mendenhall's road maps of the eastern states, middle states and middle western states are standard and should be in the hands of all automobilists desiring to tour in any of these sections.

ON June 1, the New York office of the Swinehart Clincher Tire and Rubber Co. will remove to 875 Seventh avenue, where they have leased a three-story building. Their Chicago branch will remove, about July 1, to a new three-story building, at 17 Michigan avenue. It has been found necessary to secure larger quarters, both for the New York and Chicago offices, owing to the fact that the work could not be managed in a satisfactory manner at their old locations.

WANT ADVERTISEMENTS.

Under this head will be printed advertisements of shops for sale or to rent, or shops wanted, or situations or help wanted, or tools or machines (second-hand) wanted or to exchange, at the uniform price of two cents a word, which will include the address, for each insertion, payable in advance. No advertisement will be inserted for less than 30 cents, however small.

Remittances can be made in postage stamps if more convenient. Address,

MOTOR VEHICLE PUBLISHING CO.,
24 MURRAY STREET, NEW YORK.

4 GOOD WOODWORTH leather treads, all complete, ready for use; sold my car and have no further use for them; size 32x4; first check for $25 takes them. Box 192, White Pigeon, Mich.

CHAUFFEURS, machinists and repairmen can secure free a set of Bullard wrenches. Write us for special offer. Bullard Automatic Wrench Co., Providence, R. I.

FOR SALE—Steam Automobiles; write for illustrated bargain list. F. W. Ofeldt & Sons, Nyack, N. Y.

$11.50 BUYS a practical wind shield; $19.50 a folding plate glass front, complete attachments; can save you money on all supplies. Auto Accessories Co., box 275, Chicago, Ill.

CHAUFFEURS, automobile salesmen, mechanics, repair and garage men furnished without charge; only experienced and reliable men, no school students unless wanted; all are guaranteed and bonded by Automobile Sales Corporation, 1661 Broadway, New York.

FOR SALE—Bargains: one new four-cylinder air-cooled auto engine, one new six-cylinder dash coil. Address for particulars Edwin G. Booth, Stanley, N. Y.

MODEL A CADILLAC—Removable tonneau, with deck, new tires, lamps, generator, etc.; car in perfect running order; make me offer; write at once. Jos. T. Levanduski, P. O. Box 45, Rockfall, Conn.

SOME SNAPS—1908 searchlights and generators, samples used for show purposes only, direct at half price, while they last. Miller Mfg. Co., Peekskill, N. Y., Dept. D.

FOR SALE—A $750 steamer for $200; has all latest improvements. Address R. Godfrey, Meriden, Conn.

RENAULT—35 to 45-h. p., light touring body; full equipment; imported July, 1907. Palisade Mfg. Co., Yonkers, N. Y.

PRACTICAL FORMULAS — Ink-erasing fluid, typewriter ribbons, carbon paper, rubber stamps, imitation gold, imitation silver, German silver, white metal, pewter, to harden steel, cement iron, toughen steel, restore burnt steel, resharpen files, nickel plating without battery, 35c. each. Parks & Co., Chem., 608, 234 LaSalle st., Chicago, Ill.

FOR SALE—Model "D" Jackson, in fine order; small delivery car 600 lbs. capacity; three-cylinder runabout and running gear, or will exchange for universal milling machine and lathe if in good condition. Torbensen Motor Car Co., Bloomfield, N. J.

SOLICITORS WANTED.

WE WANT MEN in all parts of the country to solicit subscriptions for the AUTOMOBILE DEALER AND REPAIRER, and are prepared to offer extremely liberal terms. For particulars address the Motor Vehicle Publishing Co., 24 Murray street, New York.

TIRES. 1908. CLEAN UP. NEW GOODS. Purchased during money stringency, made for guaranteed stock. Will sell as follows:

28x2½	$10.00	30x3½	$18.00	30x4	$19.00
28x3	14.00	32x3½	20.00	32x4	21.00
30x3	15.00	34x4½	26.00	34x4	22.50

Write for particulars on batteries, coils and other sizes of cases and tubes. Chicago Vulcanizing Co., 1461 Michigan ave., Chicago, Ill.

TIRES RECOVERED, 12.00 up, according to size. Non-skid, leather, rivet shod tread, $15.00 up. All kinds repairs done promptly and reasonably. Very best material and workmanship. All recovers guaranteed 2,000 miles. Good second-hand tires $10.00. New York Steam Rubber Tire Repair Works, 306 West 52d st., New York City.

FORD RUNABOUT OWNERS—Modernize your car with Rumble seat and trunk, $15. Glass front, $12; 3-hinged folding hood, $8; roadster fenders with brass bound running board, $12. Discount to dealers. State your wants for catalogue. Auto Rebuilding Co., Chicago, Ill.

FOR SALE—ALUMINUM CAN BE SOLdered successfully by using Aluminum Solder and Flux. Sold by E. F. Lester Co., Fayetteville, N. Y. Write for booklet.

AUTO TIRES—We repair any tire that can be repaired. Prices reasonable. La Fayette Auto and Tire Co., 513 North 9th st., Lafayette, Ind.

FOR SALE—Valuable Patents, covering Automobile Transmission Mechanism. Inquire of Ft. Wayne Gear Co., Ft. Wayne, Ind.

WILL exchange 188 acres in Brevard County, Florida, located between Indian River and ocean, for a good touring car. Address Lock Box 612, Hood River, Ore.

HAYNES MODEL O—30 H. P.—In first-class condition. Speedometer, Sprague top, shock absorbers. Just overhauled at factory. H. B. Coblentz, 649 Florida ave., N. W., Washington, D. C.

FOR SALE—Beautiful new 50 horse power, seven-passenger Pope-Toledo Model "U" 15 touring car, finished in coral red. Patent leather upholstering, beautiful cape top, 10-in. Rushmore head-lights. Will take for part pay any good standard runabout. Robert Holmes & Bros., Danville, Ill.

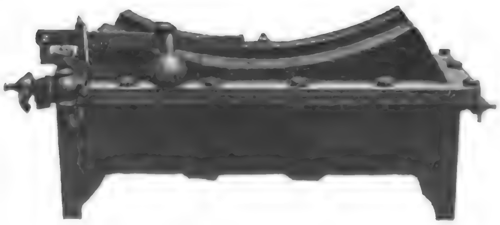
FOR SALE—Renew Old Dry Batteries; tested recipes for renewing sent for 25c. Roy Graham, Stockton, Kansas.

REBUILD YOUR CAR into "Gentleman's Roadster." We make latest style hoods, radiators, tanks, fenders, "hood dashes," glass fronts, auto trunks, Rumble seats, etc.; 20% saved. Your old car re-designed free. Hood and Dash outfits for '03 and '04 Ford, Cadillac and Winton in stock. Smashed lamps and radiators repaired like new. State your needs for catalogue. Auto Rebuilding Co., Chicago, Ill.

FOR SALE—300 sets 28x3 best grade artillery wheels, fitted with clincher rims, less hubs. Write for bargain prices on single sets or the lot. Thomas B. Jeffery & Co., Kenosha, Wis.

FOR RETREADING TIRES.

The Kracker-Jack Vulcanizer Company, 1120 Pine street, St. Louis, have put upon the market the Kracker-Jack Vulcanizer, which is proving to be one of the biggest sellers of the season. This vulcanizer, which is intended for the smaller garages and repair men, but particularly for the auto owner, is something entirely new in the way of vulcanizers, and its performances put it into a class by itself. It not only makes all kinds of patches and repair work but will entirely retread a casing without removed of same from the wheel. It is made in all sizes to fit any casing, and has a detachable face plate, so that it may be quickly changed from one size to another. Some of the claims the company make for it are: That it will entirely retread a casing without removal from wheel; that it has a device which will absolutely prevent the rubber from being burned, and is adjustable to any degree of heat; that it will fit any tire; make any kind of repair while case is still on the wheel; that it will repair inner tubes; that it will make a patch from one inch up to one-sixth the circumference of the casing; that it will repair any style or size of solid rubber wheels for autos, carriages or commercial vehicles



Kracker-Jack Vulcanizer.

as good as it does the pneumatic tires; that any amateur can operate it successfully, and, what is more to the point in these hard times, that it will cut down your tire expense to one-fourth what it now is. The complete apparatus, including mold, generator, can of vulcanizing cement and enough para for a number of patches retails at $35.

Following is a letter, one of the many which the company is receiving from all parts of the country, and is signed by Mr. R. J. Connery, the crack first baseman of the Hartford, Conn., team, who is an enthusiastic automobilist:

Hartford, Conn., April 15, 1908.

Kracker-Jack Vulc. Co., St. Louis:

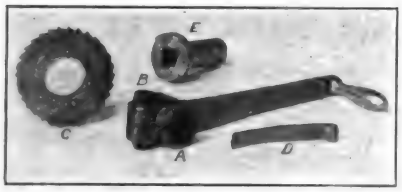
Gentlemen—I received the Kracker-Jack Vulcanizer you sent to me and must say that it has exceeded my expectations. I have an old discarded 32x4 tire that I thought I would practice retreading on, but after I had tried the first lap it looked so good I decided to finish it; so I retreaded it completely, and while I did not finish it off as smoothly as they would in the rubber factory I made just as good a job, as far as wearing is concerned, and it cost me just $1.50 for the para I used, and I had been paying $14 to retread a casing. I have been running on that casing now for a month and it looks good.

(Signed),

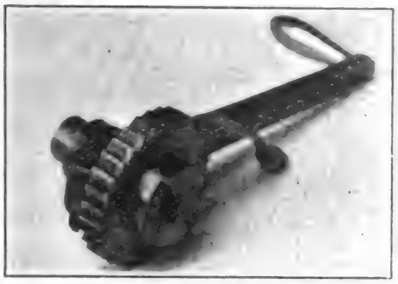
R. J. CONNERY.

SAFETY CRANK FOR MOTOR CARS AND BOATS.

This invention consists of a ratchet, C, fastened to the handle, A, to stop the crank handle from revolving backward, and a friction sleeve, E, to allow the engine and shaft to revolve backward without the crank handle in case



the engine back-fires, as sometimes happens. In practice, the screw, B, on the handle is set sufficiently tight to hold the sleeve, E, from slipping under ordinary conditions, but should the engine run backward, it would allow the shaft



and clutch, E, to revolve with the engine without the handle, and without the risk of breaking the ratchet or pall, D. In other respects the clutch operates the same as those in use, and is thrown off as usual when the engine starts right.

This safety crank handle is manufactured by W. S. Jones, Plainville, Conn.

CEMENT THAT REALLY CEMENTS.—In our last issue we referred to the F. B. Parks Rubber Cement Co., and the admirable cement which it manufactures, but through a printer's blunder, the address was left off. They are located at 173 Prescott street, Grand Rapids, Mich. It is said that this cement contains no acid to corrode the rubber, and invariably outlasts the rubber. The hottest day in summer doesn't feaze the patch or plug put on with Parks's cement. It has been in constant use in all parts of the country for four years, with the demand steadily increasing. The manufacturers are anxious to have every one of our readers try this preparation and make a special offer in connection with it. They will send a sample can postpaid for 50 cents to any one who, in writing for it, will mention the AUTOMOBILE DEALER AND REPAIRER.

NORWOOD VEHICLE CASTER.—In this issue will be found the announcement of the Auto Supply and Storage Co., 1416 Madison avenue, Baltimore, Md., with an illustration and brief description of their vehicle caster or portable turntable, made in one piece. Cars can be run on or off from either end, and the heaviest cars are handled in the most limited space. But consult their announcement, and in writing to them mention the AUTOMOBILE DEALER AND REPAIRER.

STEEL CASTINGS.—In this issue will be found the announcement of the Crucible Steel Casting Co., of Lansdowne, Pa. This company makes a specialty of automobile work and promises prompt shipments. In writing for further particulars mention the AUTOMOBILE DEALER AND REPAIRER.

BRAZING CAST IRON.—The A. & J. Mfg. Co.,' 18 West Randolph street, Chicago, Ill., says there is money in brazing cast iron, and they will show any of our readers how to do it. Write to them, mentioning the AUTOMOBILE DEALER AND REPAIRER. See their advertisement on another page.

Classified Buyers' Guide.

Index to Advertisers.

NON-SULPHATING
Storage Battery Igniter

Size 66.

6 Volt, 60 Ampere Hour.................... .... **$15.00**

GUARANTEED for one year.

Send for Catalog.

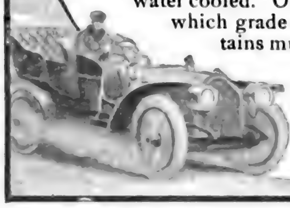
GEISZLER BROS.,
518 West 57th St., New York City.

OIL for Both Sides of the Cylinders

Upon perfect lubrication *in*side the cylinders depends the very life of your automobile. *Out*side the cylinders, on other parts of the automobile, it's only a question of wear. Lubrication in either case is made a scientific certainty by the use of MOBILOIL, the friction-proof, *trouble*-proof oil. There's a grade of

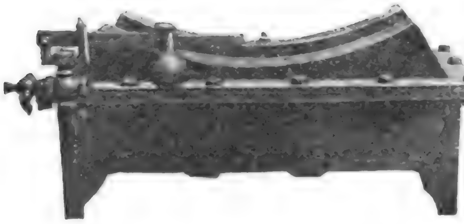
VACUUM
MOBILOIL

for your car, whether steam or gasoline, air cooled or water cooled. Our booklet, sent free on request, tells which grade of MOBILOIL to use. Also contains much useful information for motorists.



MOBILOIL in barrels, and in cans with patent pouring spout, is sold by all dealers. Manufactured by

VACUUM OIL COMPANY
Rochester, N. Y.



THE KRACKER-JACK VULCANIZER

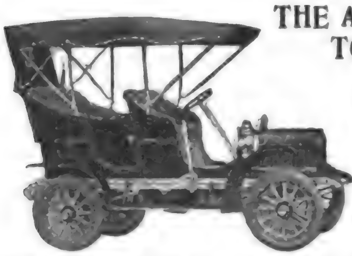
(Patents Pending)

is the only Vulcanizer made by which you are enabled to make all kinds of repairs for all kinds of tubes and casings and to

RETREAD 'EM YOURSELF

without removing the casing from the wheel, and in less time and with less trouble than it would require to remove casing and send it to the repair shop. This is not a little toy vulcanizer to put on a patch the size of a quarter, but a practical machine, making patches up to one-sixth the circumference of casing at one application. AND YOU CAN'T BURN THE RUBBER. Any one can operate it. Will repair solid rubber tires. Write to-day. Representatives wanted in unoccupied territory.

KRACKER-JACK VULCANIZER CO., 1120 Pine St., St. Louis, Mo.



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We Want your 1908 Orders. Get our prices before buying.

209 E. Columbia St., Fort Wayne, Ind.

MANUFACTURERS OF

AUTO TOPS

that are neat, durable, and made to fit all cars, large or small; try us on RUSH ORDERS.

GASOLINE STORAGE UNDERGROUND OUTFITS

$12.50, $25.00, $35.00, and up.

GOOD GOODS. LOW PRICES.

LUBRICATING OIL TANKS ALSO.

$3.50, $5.25, $6.50, $10.00 and up.

Cabinets, $15.75 to $100.00.

Oily Waste Cans, meeting insurance requirements.

Accurate Measures, and good funnels.

Kamp Kook's Kits that please tourists.

Ask Your Dealer. Send for Catalogue.

MANUFACTURERS SINCE 1869.

F. CORTEZ WILSON & CO.,
247 LAKE STREET, CHICAGO, ILL.

Pads and Numbers for the Trade

NEATEST ON THE MARKET

Send for Sample Pad.

A. P. STILLMAN
164 Duane St. New York

4x4 AIR COOLED MOTORS

$80.00 each for July only

Transmissions, $23.00 each.

Write for Catalogue.

AUTO PARTS CO., 27-29 South Clinton St., Chicago, Ill.

BLASIER TOPS

Right Prices
Prompt
Deliveries
Correct Fit

Glass Fronts
Practicability
Durability
Style

Ask for Catalogue Samples, Prices, Etc.

M. E. BLASIER MFG. CO., Utica, N. Y.

WEBER PORTABLE TURN-TABLE TRUCKS

For Automobiles. Patented.

Don't Pay for your Turn-Table twice, buy only the original.

The U. S. Courts have just declared our Patent good and valid in suit against the Pike's Peak Manufacturing Co. We have started suit against "Norwood" for infringing. The only sure way of buying an Auto Turn-Table or Truck is to see that they are branded "The Weber Portable Turn-Table Truck."

FOR SALE BY ALL JOBBERS.

Headquarters, and all orders to be sent to

The Weber Cycle & Supply Co.,
No. 6 East Kiowa St., Colorado Springs, Colo.

MENDENHALL'S ROAD MAPS

MAPS AND GUIDES FOR AUTOMOBILISTS.

SEND FOR CATALOGUE.

C. S. MENDENHALL, PUB.,
39 Opera Pl., Cincinnati, O.

Automobile Dealer and Repairer

A PRACTICAL JOURNAL EXCLUSIVELY FOR THESE INTERESTS.

VOL. V., NO. 4. NEW YORK, JUNE, 1908. PRICE { 10c. PER COPY / $1.00 PER YEAR

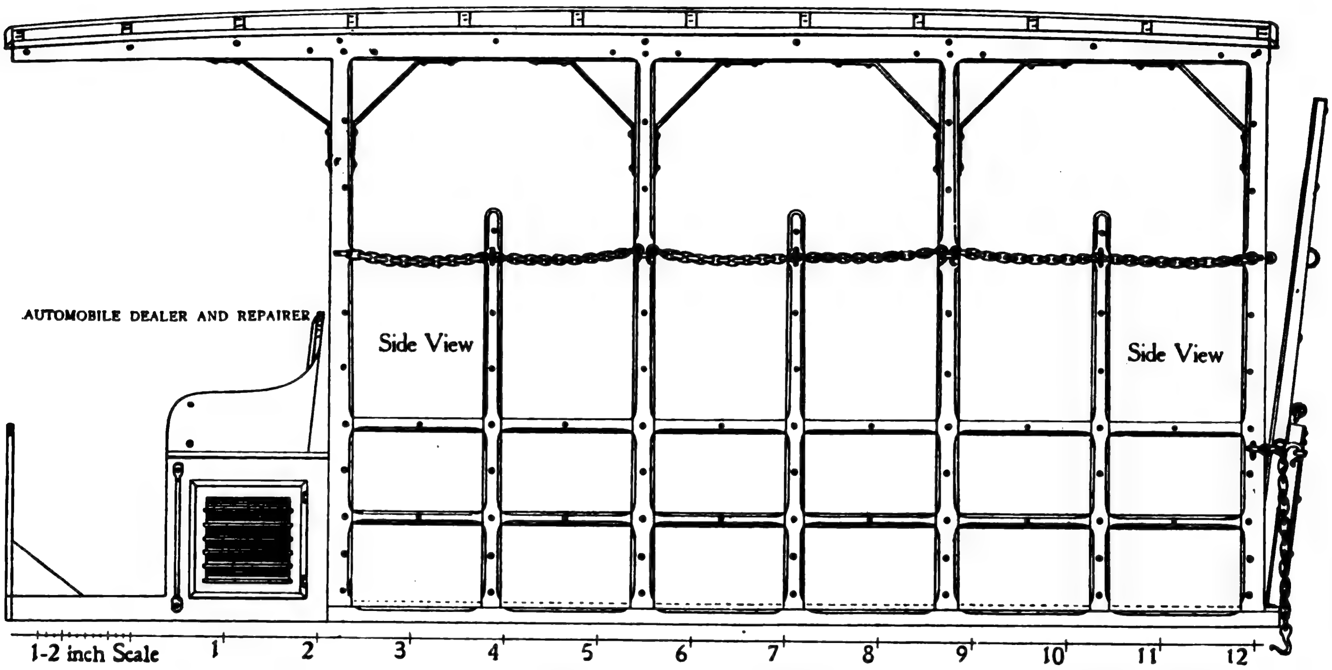
A MOTOR TRUCK BODY.

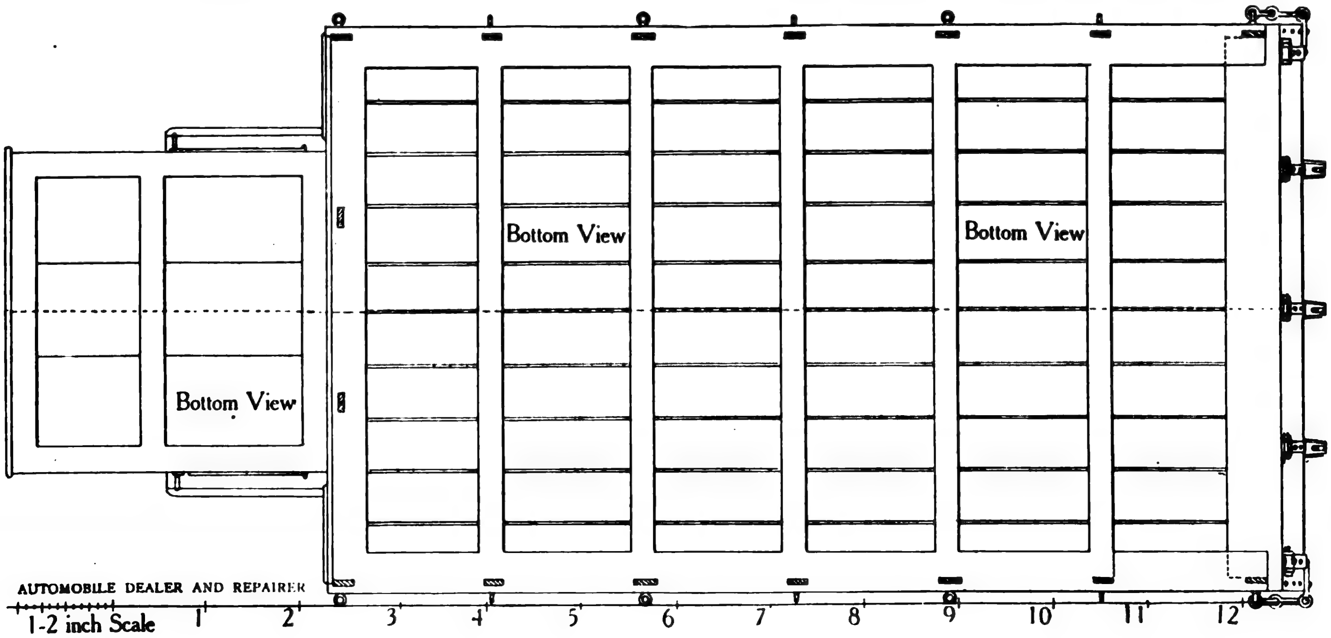
How the Repair Man May Put One on a Forty-Inch Wide Chassis.

BY AUTO REPAIRER.

In fitting a motor truck body upon a chassis it is usually raised from 3 to 4 inches above the wheels. If the wheels are 30 inches in diameter the body is 33 to 34 inches from the floor, and if 36 inches the body is from 39 to 40 inches from the floor. This height is the average of horse-drawn wagons and trucks, when the wheels turn under the body.

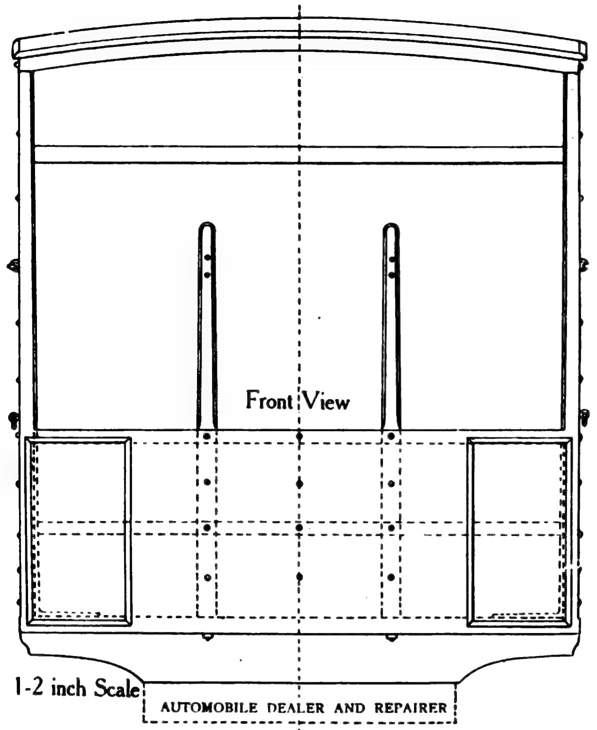
The order for the truck illustrated was an unusual one; the space for width, length and height had to be suited for two rows of boxes 33x33 and 38 inches long, and sufficient room for three lengths. Again each box should, when loaded, rest against the four posts on each

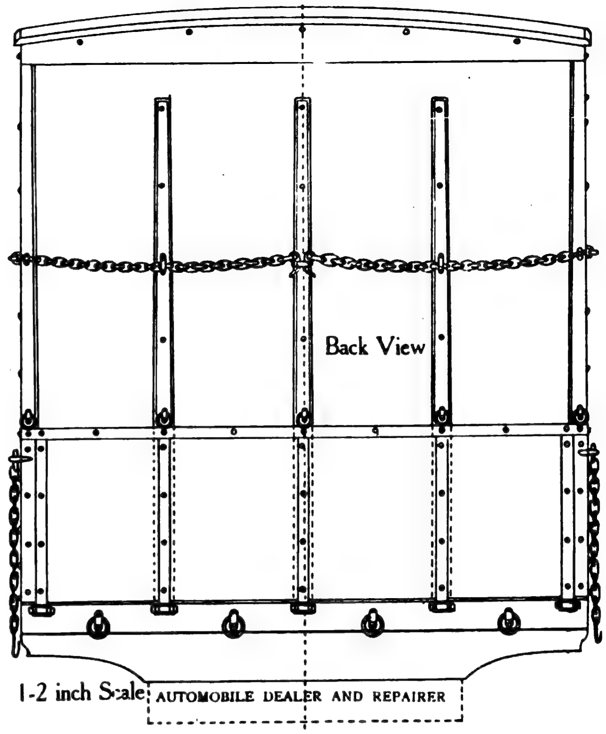




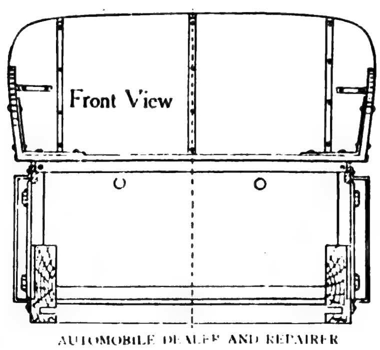
side, so that there should not be any possibility of slipping sideways.

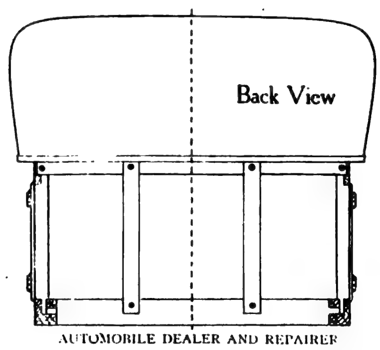
The entire length of this body from post to post is 10 feet. From this must be deducted 1¾ inches for the front partition and 2½ inches for the rear posts which are bolted to the rear gate. This will leave about ¾ inch space between the boxes and front and rear of body.





There must be space between, as the boxes are not always exactly square. The width of the body between the post irons is 68 inches and the boxes 66 inches, making 1 inch play room on each side. The post irons have no strap bolts but have 10-inch long corners. These corners do not rest on the bottom boards but on the bottom bars, so that when the cases are slighted in from the rear the bottom boards should be clear of all obstructions. All these iron corners must be let in the bottom boards. The height of the body is 69 inches from the surface of the





bottom to the top rail, which leaves 3 inches space between the upper case and bottom surface of the cross bar.

Particular attention has been paid to the slipping of the cases, as the goods to be carried are expensive and their safety must be assured. The cases on the sides of the body rest against the main posts, and the posts between the main posts and the chains will prevent slipping. In front there are two posts and a cross rail, consequently there is no possibility to slip in that direction. In rear there is the drop gate with three posts bolted to the gate, being hinged to the cross bar with five hinges. The three posts are long and reach up as far as the cases. Besides, there is a chain across which hooks to the side posts, and also one which hooks into the drop gate hooks.

The top rail is braced to each side of the main posts, and in front the top rail reaches over as far as the dash board, giving protection from rain and sun. The curtains on each side are made in four pieces, and are buttoned to the top rail directly under the drip moldings and to the posts. The rear curtain is in one piece. The curtains extend 6 to 8 inches below the body rail.

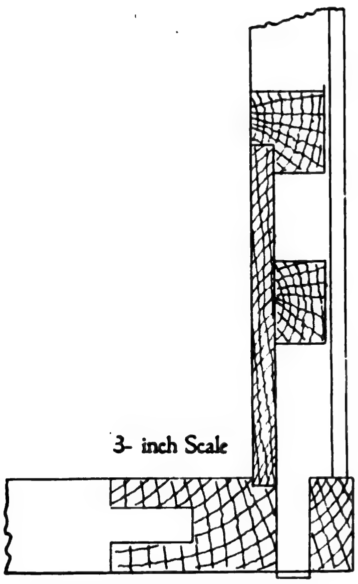
In the automobile repair shops, where also new bodies are built, simplicity is the general rule. The mechanic takes a ¼-inch by 6 to 8-inch wide board and for length somewhat higher than the body is to be. Straighten one edge, square bottom edge of sill, also top surface and all the rest, as shown on 3-inch scale drawing, except it must be full size, and all sizes must be correctly marked in its right place.

Mark sill 2x5¼ inches, cross bar tenon ¾x1¾ inches. All post tenons ¾ inch scant. Height of sides from bottom surface of sill to top of body rail 26 inches. The body and center rails are 1¾ inches deep, divide the space equally between the body rail and sill, which will be the place for the center rail. Mark the height of top

rail at bottom, front on top, center on top and back on top; this will give all the heights on the panel. From the straight edge of panel mark outside surface of sill; mark main post and set them inward 1/8 inch from outside of sill. From outside of post line mark 2 inches inward, which is the inside post line. Mark 1/2 inch thick ash board which is cut into the posts, making it level with the inside surface of the posts. Now mark the outside surface of the small posts which are 1 3/4-inch thick and are set inward 1/4 inch from the main posts. The rails are set in 1/8 inch from the small posts or 3/8 inch from the main posts, breaking all the joints for the rails on each post.

The body rail is 1 5/8 inch thick, and the 1/2-inch thick ash board is rabbeted in the rail, as shown on the 3-inch scale drawing. The center rail is 1 1/8 inches thick, and 1/2-inch thick board is grooved into the sills 1/4 inch deep, as shown. The top rail is marked the same way. It is level with the outside main posts and is 1 1/4 to 1 1/2 inch thick.

There are no arbitrary dimensions for the front seat, and its sizes depend entirely on the width of the chassis



AUTOMOBILE DEALER AND REPAIRER

and the machinery under it. The size as drawn and the dimensions we give will be right for most of them, but the best plan is always to inquire in all particulars as to sizes from all directions, also relative to the cross bars, as they may be in the way as drawn.

The entire length, including the dash, is 42 inches, which gives a length from dash 21 inches and from front of seat to post 22 inches. The width across is 40 inches, or the same width as the chassis, making it level with the chassis. The seat stands over 2 inches on each side and the side flare of the seat is 1 inch each side, making the seat 44 inches across the bottom and 46 inches across the top, and 1 inch turn under on each side.

The sills are 3x3 inches, so are the three cross bars. If the center and rear cross bar should be in the way of the machinery the front cross bar is used only and the bottom board in front is rabbeted into the sill. Under the seat are no bottom boards at all. There are three side pieces on each side, four uprights and two upper horizontal pieces. The uprights have tenons at the bottom, and mortises in the sills. The uprights have mortises and the horizontal piece have tenons. This makes the best of joints if glued and driven against the shoulders with draw pins.

There is a door on each side, which is hinged to the rear uprights.

The three seat pieces are 3/4 inch thick and of ash or poplar. The side pieces are straightened with corner irons front and back, as shown, and the back piece is stiffened with three uprights, as shown on front view.

The seat frame is composed of four 3/4x4 ash pieces mortised or lapped together.

Coal Tar for Top Dressing.

While coal tar has been widely used, both abroad and in this country, as a top dressing with which to make improved highways waterproof and dustless, there are very few automobilists who know just what it is and fewer still who know anything about the way it is produced. The Bureau of Forestry at Washington, in a recent bulletin, gives the following information:

Coal tar is composed partly of a substance known as carbon and partly of compounds of this carbon with the gas hydrogen, and which are known as hydro-carbons. When the coal tar is heated sufficiently away from the air, the hydro-carbons are driven off in the shape of a gas. Illuminating gas is made by subjecting coal tar of the proper kind to this process, which is known as dry distillation.

The coal is put into a long fireclay oven or retort and heated to about 2100 degrees. Under this intense heat almost all the hydro-carbons pass off, leaving behind only the 'fixed' carbon, in the shape of coke. As the gas comes from the retorts it is a thick yellowish green before it can be used. Many of the compounds distilled will remain in the form of gas when cooled to ordinary temperatures, when the original gas is cleansed from its impurities. In the condensers, which cool the gas, the heavier compounds are left behind in the shape of thick liquids.

"The heavy, strong smelling black liquid left behind by the first cooling is what is commonly known as coal tar. This is an exceedingly complex mixture of substances, from which are obtained costly perfumes, dyes, medicines and a host of other things, including flavoring extracts. Coal tar is also produced by what is known as the byproduct coke oven, used for the production of coke for steel making. In recent years gas has been made very largely by another process, which produces what is known as 'water gas.' This process also produces tar that is very similar to coal tar and difficult to tell from it

The Buggy Car.

Charles E. Duryea, an acknowledged authority, says: "The needs which brought the buggy into use by every farmer and into many city families still exist. The large touring automobile does not fill this need, just as the heavy wagons of Joseph or Nero did not fill the original buggy need, so that to-day we find a demand for a power buggy. Perhaps it has always existed, but if so it is only recently that inventors have been able to supply the simple design—the powerful light motor and the strong special needs that have made it possible.

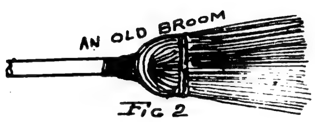
"The buggy automobile is to-day being marketed by nearly fifty different makers and ranges through every variety from a common buggy to which has been applied a motor and sprockets to a full fledged automobile, whose only right to the buggy classification lies in the use of large wheels and a body much of the buggy shape.

"All these forms cannot survive. The sifting process of time will gradually weed out the less suitable ones, and in a few years we will see a fairly standard form of motor buggy."

THE CLEANING DEPARTMENT.

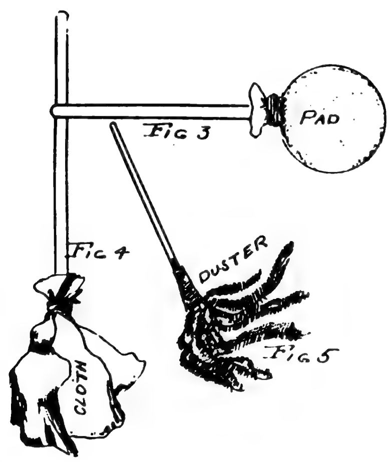
Suggestions as to the Proper Method of Washing the Car in the Garage.

The cleaning department of the modern garage has taken quite an important place in the motor vehicle world during the past few years. There are now expert motor-vehicle cleaners, just as there are cleaners of carpets and rugs. You can run your car into a garage or other place where the cleaning is done and get your machine back in



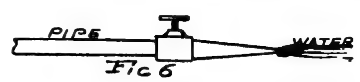
due course, in a first class, clean and lubricated condition. As one passes the garage, he observes a notice to the effect that motor vehicles are cleaned there. The operation involves the use of certain articles under certain conditions. The accompanying illustrations exhibit some of the devices as employed by the men working in the cleaning department of the garage.

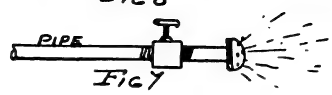
In some of the shops you will find that carelessness prevails. In one place I observed that the cleaning brushes were old and worn as in Fig. 1. Then in another case the



cleansing of parts of the machine was done with an old broom, as in Fig. 2. You cannot employ defective instruments and expect to have good results. The brushes should be soft. If the tips are in condition to scratch, the enamel will be defaced. I have seen the body work of a new car badly scored with defective brushes. A soft pad, something like that in Fig. 3, can be used to advantage. This is made of chamois skin, bound about a stick and packed with cloth to make the pad. Polishing can be accomplished with this.

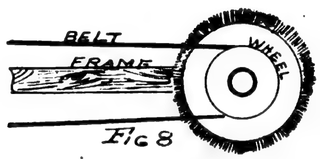
Sometimes a mop-like device is used for cleaning purposes, as shown in Fig. 4. You should be chary of slipshod articles of this nature. The cloth is often rough to the point of scratching the enamel. There maybe gritty matter like particles of sand in the fabric. A soft fabric should be used. The duster in Fig. 5 comes in for active service for removing dry foreign matter on the smooth surfaces. Even the duster will scratch and mar the sensitive surfaces of fine enamel. You have to use considerable



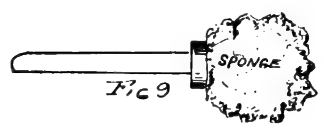


precaution and judgment, otherwise you will ruin the surface of a car and have a bill to pay. Soft cloths and pillow like pads will do the work well and without danger of defacing the surfaces.

The hose line can be used to good advantage if properly arranged. It will not do to deluge the car as some do, but it is a wise plan to wash the exterior parts with clear



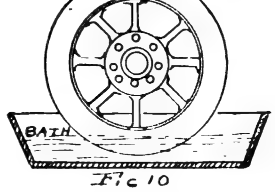
water. Some go over the whole exterior with a sponge and water from a pail. This is slow work, and water in a pail gets muddy very quickly. The fresh stream from the hose scours off the surfaces in good form. You can use the straight form of pipe nozzles as in Fig. 6, or the sprinkler style as in Fig. 7. Both kinds are in regular use in cleaning departments. There are times when it becomes necessary to apply a revolving wire point surface to parts on which hard, crusty matter has corroded. A scratched



wheel with wire tips is shown in Fig. 8. Common steel card clothing is obtained from the textile cotton carding machine makers.

This carding wire is placed about the wheel as in Fig. 8 and the wheel is arranged to run on a bearing on the piece of wood frame. Hence the wire-pointed surface can be held up against any surface and operated. The belt drives the wheel at moderate speed. The affair is readily managed. Sand wheels can be run on the same plan.

Fig. 9 shows one of the modes of attaching a sponge to the end of a convenient stick for sponging the surfaces of



the car. Difficult places can be reached quite easily with this device. Fig 10 shows one of the tubs for the tire baths. The tub is simply a sheet metal affair about four

inches deep and long and wide enough to accommodate a wheel tire. The wheel is placed upon a stud so that it can be revolved readily and then the cleaning begins by washing the tire while turning it in the bath. Sometimes the tires are washed in this manner while still on the car shaft, in which case the shaft is elevated on that side so as to permit the wheel to be free.

Then there are utensils needed in which parts of gummed and corroded cams, wheels, studs, etc., may be

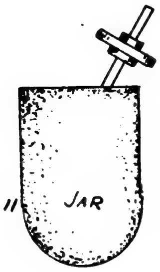


Fig 11

soaked to loosen the matter. Jars like that in Fig. 11 can be employed. Lye water or other impregnating substance can be used to eat into the foreign surfacing. The stuff is thereby loosened and can be washed off readily.

Then there is the cleaning out of the oil holes. This can be done with a pointed instrument like that in Fig. 12. The

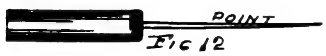


Fig 12

oil holes are almost sure to get clogged in the general use of the car. A hot box may result. It is a good plan to have a number of these points at hand for immediate use. Often the oil hole is merely stopped with the little dust. The point being inserted in the hole, the hole becomes clear and the oil will pass to the bearing.

Points on Driving.

Winthrop E. Scarritt, former president of the Automobile Club of America, and chairman of its committee on public safety, has addressed the following warning to motorists:

"In view of numerous complaints recently made the committee on public safety of the Automobile Club of America calls especial attention to certain recommendations contained in their report sent broadcast a year ago, as follows:

" 'We urge upon motorists the wisdom of not using acetylene lights on ferries or in closely built up and well lighted portions of cities and towns; also not to cut out the muffler except in places where the noise of the exhaust cannot annoy or offend other users of the highway; also to avoid flooding the engine with oil, thus creating offensive smoke and odor. Let us correct the evils within our own ranks rather than wait for outraged public sentiment to do so.' "

The tendency of new drivers to cut out the muffler and to use too much oil in the cylinders always has been a sore trial to the older and more thoughtful automobilists, who frown on this habit which seems to be an odd mixture of a wish to show off and ignorance of the proper way to lubricate cylinders. So many men driving their first automobile are possessed of a desire to emulate some famous race driver who pilots a car with open exhaust that they really are not happy for a long time unless they have the muffler cut out and the engine racing away as fast as it will turn over.

Of course, this habit wears off as owners become more accustomed to their cars and begin to realize that while such tactics may be spectacular they are also expensive when gasoline and lubricating oil bills have to be paid. One old time dealer says he can always tell when a new driver is coming up behind him on a country road, because the novice is practically certain to be making as much noise with his car as is possible, sometimes from lack of knowledge concerning the workings of his engine and in other instances to impress some friend with him just how much of a real daredevil he has become in a few short weeks.

The drivers of the various types of taxameter motor cabs are about the worst offenders so far as flooding cylinders with lubricating oil is concerned, and apparently no change for the better is to be made until some local ordinance is adopted on the plan of one in force in Paris, where offenders in this particular class are fined for filling the air with the evil-smelling clouds of blue smoke. Experienced drivers rarely offend in this respect and the nuisance could be practically abolished if drivers were to exercise a certain amount of systematic supervision of the lubricators of their cars.

A Fine Public Garage.

It is better to spend money in making a public garage fireproof and convenient than to expend it in outside architectural ornament. This was evidently the purpose of the new garage of the Livingston & Ramsdell Car Company, who have recently taken possession of their

GARAGE OF LIVINGSTON & RAMSDELL CAR CO.

new garage at 284 Halsey street, Newark, N. J. This structure is not only completely fireproof but it is up-to-date as to all the conveniences of storage, repair and cleaning.

The building is three stories, of concrete and steel construction, and well lighted. The entire three floors are given to storage, and a well-fitted repair shop is located in the rear. There is an electric elevator of four tons capacity for carrying the cars to the different floors. On the second floor is the drivers' room, and this is fitted up with such features for reading, games and other diversions that the chauffeur will not find his stay there irksome or wasted. A ladies' room for patrons of the fair

sex is also a feature, and this is supplied with everything intended for comfort.

The storage arrangements are admirable, each car not only being allowed liberal space but a locker for supplies. The firm deals in tires and accessories, and the entire establishment is complete in all details for the business.

FOR A LONG TOUR.

Something About the Type of Car and the Luggage.

The first thing to be considered in preparing for a tour of four or five persons is, What are the conditions of the tour? Assuming that the tourist wishes to travel over any kind of country, and be absolutely independent, he will probably require a different car from that which is best suited for touring in a specified area and from a center. If he is setting out to tour the whole country as it comes, give and take, flat and hilly, it is essential that his car shall be sufficiently powerful to take all hills comfortably without dismounting passengers.

It is desirable that, in addition to passengers, all their luggage should be carried without overloading the car, and it is of course necessary to carry something in the way of spares for tires, a few inner tubes, a complete spare wheel, rim, or tire, or perhaps a spare wheel and extra cover. These are heavy and cumbersome luggage, and the question how to dispose of them is a tiresome one, and one often feels inclined to go without and take the risk of tire troubles. Therefore in order to minimize the quantity of tire spares to be carried it is preferable to select a car that is light on tires.

Now the high powered car is notoriously expensive in tires and also in gasoline. Therefore the car with more power than is necessary should be avoided. The deduction points toward a car of medium power, say, 25 or 30 horse power, and even then a car that is light on tires. Two technical papers have recently been read explaining many of the reasons why one car is "heavy" and another "light" on tires, and perhaps one of the reasons most readily grasped by the untechnical mind is that a "dead" or "unsprung" load is a cause of heaviness on tires. The unsprung load includes the axles, the wheels and the tires themselves. Now it would obviously be unwise to lengthen the life of the tires by using a car with axles insufficiently robust, and no one would advocate lightening the tires themselves. But by using wire wheels a saving of at least 15 pounds per wheel of "dead" load may be effected. It is now becoming generally recognized that wire wheels have advantages over wood, but the advantages are perhaps greater in application to the touring car than to the town vehicle. Incidentally it may be remarked that wire wheels throw up less dust than wood wheels do. This is no doubt due to the fan-like action of the spokes on the wood wheel, causing a wind disturbance which sucks up the dust that is loosened by the tires.

The next thing to be considered is the type of body work. For all the year round touring the limousine with canopy extension is perhaps the most suitable, but for the summer months the open car with some collapsible or removable protection against rainy weather, such as the cape cart hood, or at least a tonneau hood with glass screen behind the front seat, is the most useful compromise. The glass screen in front of the driver is of doubtful value, and at times when it is most needed it is of least service. Unless it is cut low, it is useless in the rain, and even if cut low it is a source of danger when driving at night, owing to reflected lights, which may dazzle the driver and sometimes obscure the road altogether.

The upholstering of the carriage, both seats and backs, should be deep and well sprung. Good chassis suspension is often spoiled by insufficient care in the design and carrying out of the carriage upholstery. The seats are, as a rule, more comfortable if made one or one and a half inch lower at the back than at the front of the seat. Back rests should not be too high. High backs are uncomfortable, as they do not give sufficient freedom to the shoulders and neck. On a long drive, particularly over rough roads, a high back gives one a sensation of being hit on the back of the shoulders, and often results in a stiff neck or excessive tiredness. Plenty of leg room is essential. Nothing can be more uncomfortable than to sit with one's legs cramped up during a drive of eighty or one hundred miles.

The open touring car should have high side doors to both front and back seats. Low side doors offer poor protection in rainy weather, and in dry weather they allow the dust to curl in and smother one's clothes and the interior of the car. Here again the glass screen in front of the driver is a nuisance, as the eddv currents caused by its movement through the air produce such a prodigious quantity of dust "in behind."

There should be ample provision for carrying luggage. This question of "stowing the luggage" is a very difficult one to settle satisfactorily. If carried on the back of the car, it should be covered with waterproof and dustproof covers, and even then it is difficult to keep the trunks, etc., as clean as one would like.

The tonneau should be sufficiently spacious to carry a small steamer trunk on the floor without inconveniencing the passengers. Here the luggage may be disposed safely, and is well protected from dust and wet, and with a well-designed side entrance, it is easy to load and unload, there being no necessity to undo straps, covers, etc. Where the car is provided with step boards running the whole length between the wheels some small luggage may be carried if suitably protected. The step position for carrying luggage is certainly cleaner than the back position.

In addition to space for personal luggage, provision should be made for carrying a gallon or two of lubricating oil and perhaps a couple of gallons of gasoline. It is preferable to carry such stores as these in the boot, or in lockers on the steps, but in any case they should be so disposed that they can be got at without disturbing a passenger. The tonneau floor should not, as one frequently sees it, be used for stores of this kind. Spilled oil does not improve the tonneau carpet or the passenger's clothes or temper.

Automobile Lighting.

Acetylene gas is among the most popular means adopted for automobile lighting. Electricity, oil and gasoline vapor have in turn been tried, but have always been found unsatisfactory. Kerosene oil burning side and tail lamps still maintain their popularity for their distinct purposes, although there is some use of electric side and tail lamps.

There is a general tendency toward the elimination of the blinding light projection which diffuses from headlights into the faces of drivers of approaching vehicles and pedestrians, and there are laws in France, Switzerland and Italy which regulate this matter. Lamps should be equipped with distinguishing features, such as a green signal light in the left hand side oil lamp. This would enable the approaching vehicle to decide properly which side to pass on.

A coyote is reported to have fallen dead from fright at the first sight of an automobile in Wyoming.

MORE INNOVATIONS.

No Fly Wheel, Muffler, Cooling Device or Reciprocating Parts, and Remarkably Light.

A gasoline motor of exceedingly light weight per horse power developed has been brought out by the Adams Company, of Dubuque, Iowa.

It is the design of F. O. Farwell, patentee of the revolving cylinder motor used in the Adams-Farwell motor car, and while it is built on the same general lines as the automobile motor, by refinement it becomes an interesting example of light weight.

The two motors shown were built for a prominent Eastern inventor to be used for aeronautic experiments. For this purpose this motor possesses many interesting peculiarities. The motor has five cylinders, 4¼ inch bore, 3½ inch stroke, and is run at a speed up to 1,800 r. p. m. The motor complete in operative condition with timer, float feed carbureter, automatic force feed oil pump and oil tank, weighs 97¼ pounds. With the spider shown in the photographs, which, in this case, secures the motor to four tubes, the motor and base and all weigh 104 pounds. By the A. L. A. M. rule this motor is rated 36 horse power.

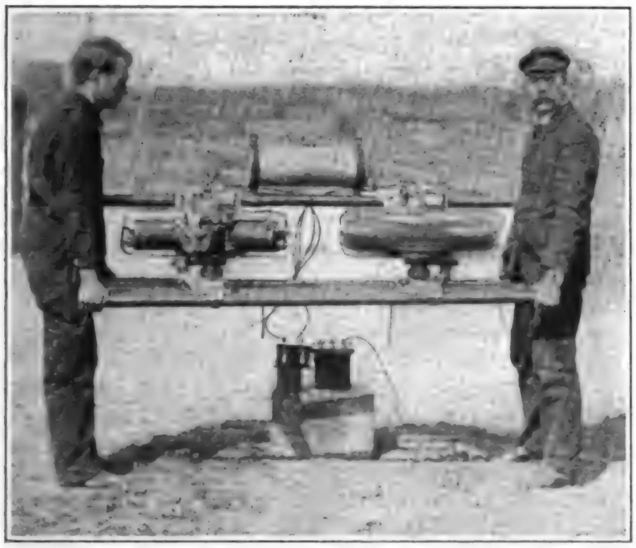


FIG. 1.—TWO 36 H. P. MOTORS HELD IN THE HANDS OF TWO MEN—ONE RUNNING AT FULL SPEED.

Fig. 1 shows two of these 36 horse power motors held in the hands of two men while one of the motors is running at full speed. The absence of vibration is shown by the clearness of the photograph of the parts not in motion. Its weight per horse power developed is believed to be the lightest of any motor not sacrificing strength and durability to weight. In comparing weights it is well to take into consideration the fact that the weight of the water, radiator, piping and fan used in water cooled motors are not often given with the weight of the motor. The light weight of this motor, which is air cooled, is brought about more by the simplicity of its construction and the high grade of the material used than by reduction of strength to the minimum. The makers say they have every reason to believe that these motors will stand as hard and continuous use as their regular automobile motors, some of which have been in use for eight years and are in fine running condition to-day.

The **Adams-Farwell motor** is not what is usually termed a rotary engine. The cylinders revolve around a common center—the vertical stationary crank shaft. The pistons and connecting rods revolve around another common center—the single crank pin. At one point the pistons reach the head of the cylinder; at another the pistons approach the base of the cylinder, but no moving part ever comes to a stop while the engine is running. It spins like a top.

Each cylinder is complete with head and part of the central crank case cast in one piece of steel of high tensile strength and they weigh only 7½ pounds each. Five of these cylinders are bolted together and to a top aluminum flange (which also forms the gas manifold) weighing 3 pounds, and to a bottom steel flange which also supports the valve cam and transmission gear. These flanges have long bronze bushes and form bearings around the vertical stationary crank shaft. In each cylinder is a cast iron piston weighing 2½ pounds. All the pistons are connected to a single crank pin by bronze connecting rods which interlock each other around a bronze lined steel bush about the crank pin.

The cylinders revolve as one piece in perfect mechanical balance around one center. The pistons swing around another common center. It is a continuous circular motion and there is no shock, vibration or loss of power in overcoming the inertia of reciprocating parts as in other motors.

By revolving the cylinders, instead of the crank shaft, it is claimed that very desirable features for aeronautic, speed boat and automobile motors are secured.

The feature of cooling is perhaps among the most important. Without one ounce of cooling device the makers claim the best cooled of all gasoline motors. The cylinders move rapidly through the air like the arms of a centrifugal blower. Centrifugal force removes the air in contact with the cylinders and atmospheric pressure supplies fresh air. The circulation of air is equally rapid on all sides of all cylinders and as the cylinders are of equal thickness on all sides the expansion is equal and the cylinders may be made light without fear of distortion.

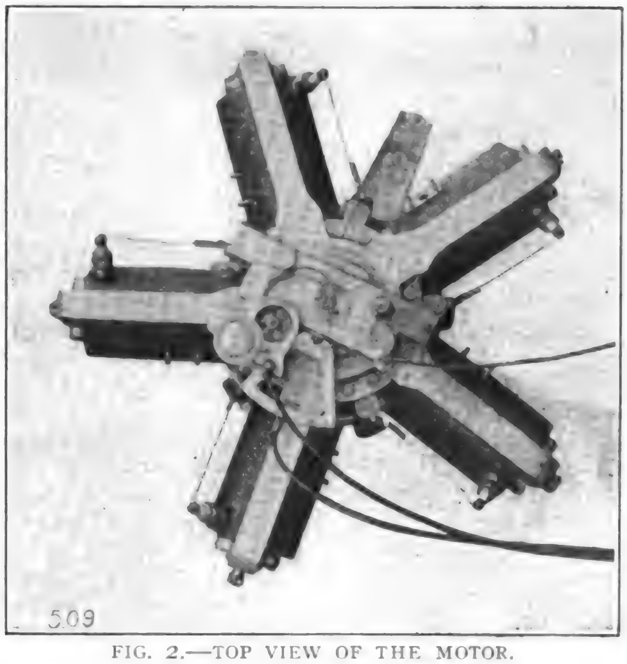


FIG. 2.—TOP VIEW OF THE MOTOR.

The result is entirely different from blowing air upon one side of a cylinder or row of cylinders.

Those who are not familiar with the results obtained by the use of the Adams-Farwell cooling system, may question the advisibility of making these cylinders smooth and without radiating flanges.

The Adams-Farwell automobile motors have always had longitudinal flanges cast with the cylinders. During the summer of 1907 a seven passenger automobile was provided with a motor of 5-inch bore and 5-inch stroke with five smooth cylinders. This machine was used to test the

cooling quality of the flangeless cylinders. It seemed to cool perfectly under the most severe conditions, such as climbing long, steep hills and long runs in deep sand. The tests made have proven that the flanges are unnecessary. It is the enormous volume of air that does the business.

While not an ounce of weight is added for balance or fly wheel, the revolving element that is utilized for balance wheel is over 80 per cent. of the entire weight or mass of the motor.

This heavy fly wheel, revolving rapidly around a vertical axis, exerts an enormous gyroscopic force to keep the motor, and that to which it is attached, on a true plane. The motor spins like a top, and like a top it has a tendency to resist being tipped over while spinning. It also has a tendency to quickly right itself if forcibly thrown out of its proper plane. It is also conducive to very steady running and transmits a constant torque to the propeller. A gasoline motor, particularly one using high compression, transmits its power by a series of violent explosions or blows, and even though several cylinders may be used to divide up this series of blows, the arms of the propeller or fan used to propel a flying machine are subjected to destructive strains unless a fly wheel of sufficient weight is

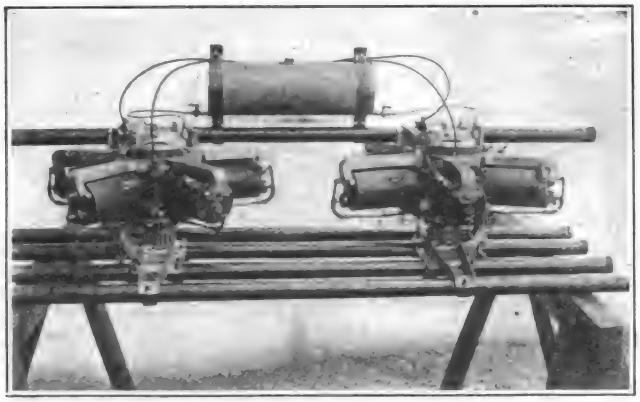


FIG. 3.—A NEARER SIDE VIEW OF THE TWO MOTORS.

interposed between the motor and propeller to absorb and distribute this series of blows.

Anything that answers the purpose of a heavy fly wheel also permits of the use of high compression, which is more economical and produces more power from the same cylinder sizes than the low compression usually used. Together with the variable compression system used for controlling the motor speed and power, it also permits of a very wide range of speeds under load.

The variable compression system referred to has been used for several years on the Adams-Farwell automobile motors and consists in mechanically holding the inlet valve open for a part of the compression stroke and closing it after a part of the gas has been blown back and taken in by another cylinder which is at the time on the suction stroke. The compression is relieved and the motor is easily turned when it starts and rnns slowly. The compression may be gradually increased until maximum speed and power is obtained and it may be as gradually reduced when stopping the motor. There is not that abruptness in starting or stopping which characterizes the ordinary gasoline motor and the propeller arms are thus relieved of much strain. After the motor is started the spark lever is set and requires no further attention. All speeds are obtained by the variable compression lever. The proper firing is cared for automatically.

The simplicity of this motor and the reason why it can be made so light without sacrificing strength will be better realized when it is understood that, in addition to saving fly wheel and cooling system weight and complication, the following essential elements are greatly simplified:

The crank shaft in this five cylinder motor is just like the crank for a one cylinder motor. It is a short single-throw crank, and although the bearings are large and long, the shaft only weighs 4½ pounds.

All the valves, ten in number, are operated by one cam. The valves have no springs to close them; but being in the head of the cylinders, and closing outwardly, they are closed by centrifugal force. The higher the speed of the motor the greater this force and the grater the necessity for a stiff spring or force to close the valves quickly.

The wiring for the ignition system of this five cylinder motor is just as simple as it could be for a single cylinder motor. There is but one spark coil, one timer contact, one primary and one secondary wire. Fig. 2 showing the top view of the motor will enable us to explain the ignition system. Fig. 3 is a near side view of the two motors. The primary wire is attached to a flat steel spring which is insulated from the remainder of the timer by a fiber block not shown. A hardened steel wheel is free on an eccentric or crank end of a short shaft, which is geared to the motor and makes one revolution to each 2-5 of a revolution of the motor. A distributor for the secondary current is formed by a strip oi brass on the lower edge of a segment of fiber supported by a bracket as shown by the photos. A short bare wire leads from the spark plug on each cylinder to a fiber insulator near the crank case. In the top of this insulator is a screw, which, when the motor turns, passes under the distributor but does not touch. When the cylinder, which is to be fired, passes under the distributor, the timer wheel makes contact with the spring and the secondary current passes to the spark plug of that cylinder. Each alternate cylinder is on the power stroke as it passes the dead center of the crank. There being five cylinders the power strokes are in perfect rhythm. After the motor is started the timer case is swung around to the left, which advances the spark to its maximum. No further attention is required. The variable compression takes care of the proper firing.

The same shaft that turns the timer wheel revolves by worm gear the force feed oil pump. This is a simple and positive device having four little cam actuated plungers each of which pumps a drop of oil at each revolution of the pump barrel.

The rectangular block shown at the top, which is clamped to the upper tube not only forms a support to the upper end of the crank shaft, but forms an oil tank for one-half pint of lubricating oil, supports the timer and oil pump, and in the right end is formed the carbureter with float feed chamber, and it supports the distributor. This complete device weighs only 2½ pounds.

The two motors shown in the photograph are now being used by a well known inventor who is making secret tests of a new type of æroplane. If these tests result as favorably as might be expected in consideration of the remarkable advantages possessed by the motors we may see a practical "heavier-than-air" flying machine this summer, and a possibility of improved motor power for automobiles.

Nearly Ten to One.

Statistics recently compiled show that the total value of American-made machines for 1907 was about $106,000,000. More than 53,000 pleasure cars were manufactured in the 12 months, all but 5,000 of these being gasoline-propelled cars. The capital employed in turning out these cars and marketing them reaches the amazing total of more than $94,000,000, 58,000 employes being engaged

on the work at the factories. These figures, be it remembered, apply only to the direct manufacture, and it has been carefully computed that in the allied trades of making tires, lamps, speedometers, etc., 29,000 additional men were employed, the business representing a capital of nearly $37,000,000. Garages and sales places employed 22,000 men, and stand for a capital of $58,000,000. Totaling these figures gives us a value of product sold in the automobile world in the United States of $106,000,000; total capital employed, $172,000,000; men employed, nearly 109,000 persons. These amazing figures partly explain why more American and fewer foreign cars were sold in this country in the twelve months tabulated than ever before. Yet France did not feel any falling off in business even if her manufacturers did not sell so many cars in this country in 1907, as before the French makers made and sold more cars to other nations than in any other year.

Why He Likes Graphite.

Charles E. Duryea seems to strongly favor graphite as a lubricant where it can be used. He says: "Graphite seems to me to be an ideal lubricant because it will not burn, smoke, carbonize or get gummy. Further it seems to fill up the pores of the iron and then the friction is that of graphite against graphite, instead of metal against metal. Of course it is the intent to have always a film of oil between the two metal surfaces, but oil in a hot engine gets very thin and either squeezes out or evaporates and leaves the walls dry. I have driven up to a stopping place with oil flowing freely and smoking a cloud, but with the engine turning freely, only to be unable to start ten minutes later because the oil had all evaporated from the walls, leaving them so dry and sticky the engine could not be cranked fast enough to make a magneto spark. Graphite would not disappear like that. I have used graphite lined bushings for thousands of miles with no attention whatever and although they did not run quite so freely as an oiled bearing, they more than made up by their freedom from attention and dirt. I have experimented with an engine having no oil about it and secured fairly good results. I am not sure but that some day we will have that kind. The fault I found was that with no oil on the rings, it would not hold compression so well as an oiled engine, and this stopped the experiment for the present. So much for the advantages. The thorn of the rose lies in the fact that it is difficult to feed if mixed with oil. It settles to the bottom of the oil cups and clogs them. It goes to the bottom of the crank case along with the grit one prefers not to stir up. If fed thickly mixed with oil, the oil disappears, leaving the graphite as a paste, which may be too thick to flow, and one part of the bearing will get dry and cut while another will be all right. My experience indicates that you want an all graphite lubrication or else practically an all oil one, but that a little graphite will greatly improve the latter. I like to squirt a little graphite into each bearing and cylinder every morning. Also a little into the crank case on top of the oil.

Use of the Brakes.

Every one who drives a car should get so used to using both the foot and the emergency brake that the movement will be instinctive. If the foot brake is used continuously when descending a long, steep grade it will become very hot, and if its design provides for a lining on the brake shoe the continued friction will soon destroy the lining. This can be prevented by alternating in the use of the foot and emergency brakes, as the destruction of the lining is not only an annoyance because of the expense which replacement would entail, but also because of the necessary loss of time while the brake is being fixed.

By setting the emergency brake lever in a position where it will allow the car to attain only the desired rate of speed and releasing it after a reasonable distance has been covered, then applying the foot brake for a time and in turn releasing it before it becomes too heated, both brakes may be kept cool. This proceess will reduce the wear on both brakes to the smallest possible amount, as the real destruction comes from heat rather than from service without heat. On hills that are long it is a good plan to cut off the spark and have the momentum of the car turn the engine over a few times in this way, which will clean out the cylinders and cool them. When this is done extreme care must be used when the spark is switched on again, as a sudden jerk will ensue unless the speed of the car is in accord with the speed of the engine.

Grease Lubricators.

Screw-down grease lubricators do not usually receive such intelligent attention as they deserve. The attention required by a grease lubricator must always depend upon its position and the work it is expected to do. For instance, a grease lubricator to a commutator shaft inside the bonnet wants practically no attention beyond an occasional twist and a refill as soon as it will turn up no further, because the heat of the engine always keeps the grease fairly soft. On the other hand, grease lubricators on the swivel pins of the steering are an entirely different matter. As a rule, it will be found that grease lubricators in this position require very regular and careful attention. It is not enough to screw them down a little every day. They should be screwed down till the grease is seen to be exuding slightly from the joints of the steering socket, and it will generally be found, especially when a car is new, they cannot be screwed down sufficiently for this purpose. The right thing to do is to unscrew the cap, push a wire down the hole, and follow it up with an injection of paraffin. The refill the lubricator with fairly thin grease and screw it home. It should be refilled and screwed home till the grease is seen to be exuding from the steering socket. It may be taken as a general rule that the grease lubricator requires attention in direct proportion to the bearing it lubricates. The more constant the motion or the heavier the load upon that bearing, the more important it is that regular precaution should be taken to see that the grease is really going into the bearing, as it is not enough to assume, as so many do, that if the lubricator is filled with grease and will not screw up any further, the grease is necessarily going into the bearing; and of all the vital places on which greasers are used none are more important than the steering pins. In fact, on the whole, we object to grease lubricators on any important parts which are constantly working, because it is so much easier and quicker to oil these parts than it is to attend to grease lubricators, however handy they appear to be.

Look Out for Grade Crossings.

The greatest danger in driving over our country roads, crossed and re-crossed as they are by railroad and trolley tracks, is the grade crossing. They are gradually being done away with, but it will be years, if ever the time comes, when there ceases to be such a thing as grade crossings, and the touring motorist will do well to familiarize himself not only with the road directions covering these crossings, but he should also keep a sharp lookout ahead of them. They show up in such unexpected places and times that constant caution is necessary to avoid danger.

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ADVERTISING RATES MADE KNOWN ON APPLICATION.

NEW YORK, JUNE, 1908.

Missing Numbers—Our readers are requested to remember that it always gives us pleasure to re-send numbers which have gone astray in the mails.

NO DISCRIMINATION.

The feeling that those who are to run cars should be subject to a rigid examination seems to be growing. Whether such examination would be a suitable test of a driver's competency is doubtful. In Chicago recently examinations of thirty applicants were held for positions as city chauffeur, and it was found that some of the best and most efficient drivers were miserable failures in answering technical questions, and those who excelled in a working knowledge of the mechanism of a car proved anything but good road drivers. This, of course, is not proof of the futility of technical examinations, but it is evidence that such examinations are not infallible.

Is there not danger that the bestowing of licenses to run cars upon such examinations will result much as in the case of our existing speed laws? In many instances those who should be punished for damage escape simply because they were conforming to the speed laws when the damage occurred, and in other cases drivers are punished for exceeding the speed law when no damage resulted or was likely to.

It is easy enough for any one who has a modicum of brain matter to acquire a working knowledge of the mechanism of a car, but this is by no means a guarantee that he is fit to run one. And if a license be considered a guarantee of fitness, is it not likely to result in increasing recklessness on the part of some drivers who have the consciousness that they have a license in their pockets, just as they are now often tempted to go to the limit of speed regardless of danger, knowing that in case of damage the fact that they were not exceeding the legal speed limit will often be considered an extenuation?

Take, for illustration, the new law in New Jersey that went into effect June 1. It prohibits the driving of a car by any person under the age of sixteen, by an intoxicated person, or by one who has not obtained the consent of the owner. If such restrictions are to apply to drivers of automobiles why not have them apply to horse-driven vehicles? There are lads of less than sixteen years who drive horses, intoxicated persons drive horses, and horses are driven without the consent of the owners. But, some one says, it is more difficult to drive a car than a horse. This is not the case. Yet, he continues, the car is liable to do more damage than the horse. And we reply: If the car is going at greater speed than the horse, but not otherwise. The ease with which a car may be stopped, its quick response to guidance and its unconfined sphere of action make it one of the least dangerous of conveyances. Then why should it be discriminated against in comparison with other vehicles?

But how about an intoxicated person? it is asked. Well, intoxication is not now held to be any excuse for violation of a law, nor does it mitigate the punishment of the offender, and as well in the case of an automobile driver as a horse driver. Why go further? But, says some one again, you do not hold that an intoxicated person is fit to drive a car, do you? and we reply, assuredly not. Neither do we consider an intoxicated person fit to drive a horse.

The question we wish to raise is whether the best way to prevent intoxicated persons from driving cars—or, better yet, to prevent them from doing damage to others from driving cars—is not to make the punishment for doing such damage "fit the crime." Make the penalty for any and all damage and for driving faster "than is reasonable and proper" without any fixed speed limit so severe that it will strike terror to the reckless and the ignorant. This is what it will finally come to.

USE OF THE HIGHWAYS.

Much is being said about the dangers from the automobile to other users of the highways, but how about the dangers from other highway users to the automobile?

The other day the writer chanced to see a lad, about a dozen years old, stand directly in the highway, evidently daring an approaching car to run over him. A party of other boys stood by the roadside watching him. Of course, the driver of the car was pretty confident that the boy would jump one way or the other just before the car reached him, but he discreetly and quickly slowed down. Nor had he any idea which way the lad would dodge before being run over.

Instances of this kind are both nerve-racking and exasperating, even though the young hopeful dodges out of the way just before the car reaches him, and after he had compelled it to come almost to a standstill. Had the lad's father observed the incident, it is doubtful if he would have administered anything more than a mild and possibly an admiring reproof. Boys of this kind usually have just such fathers. But if the boy had been injured, what a howl would have gone up about reckless automobile drivers and automobile dangers!

Meantime the highways and streets will continue to be used as playgrounds for children, chattering grounds for loafers, and fields for resting cattle, dogs and fowls.

THE UNIVERSAL MEANS OF TRAVEL.

Dealers, repairmen and garage keepers are urged as earnestly as words can enforce the idea that their business has not only "come to stay"—it has come to be finally the universal means of travel. It may not "clear the horse and the railway train off the face of the earth," but it will so nearly put them out of use that they will be used rarely and more as a matter of rare individual taste than as a convenient, cheap, quick and safe means of transportation.

A member of the Cadillac firm, one of the oldest and most successful in the business, said the other day: "We are willing to run the risk of being considered extravagant when we say in full seriousness that we have counted for

five years on the absolute elimination of the horse-driven vehicle and the universal adoption of the automobile for all the ordinary means of transportation. Our present move is based on that conviction and upon the experience of our first year when we turned out what was then considered an unprecedentedly large output—some 2,800 small cars."

Whether the time for the fulfilment of this prediction is thus set a few years earlier or not is of little consequence. The fact to consider and the conditions to prepare for are the important points. Those who are in the business should lay a substantial and broad foundation that cannot be easily demolished by some one else more enterprising and thoughtful who may come into the business later.

Get this business at your fingers' ends. If you are in it in a diletante way turn over a new leaf and give it persevering application and study. Find out all about it. If you don't, some competitor will. At present the business is far from being conducted on that phase of scientific method which consists of careful and abundant observation and experiment, and proper generalization of results.

Do not be afraid to put out a little money in the pursuit of the particular line of the business you are engaged in. If present conditions do not quite warrant it the future will abundantly confirm its wisdom.

THE RATIONAL TYPE.

It is claimed that "the wear of the tire increases with the square of the speed." That is to say, a tire will wear four times as fast going thirty miles an hour as when travelling but fifteen miles an hour. It is not clear how this mathematical conclusion was reached, but quite likely it is approximately correct.

Under the circumstances of the tremendous cost of running the big and high-powered cars at great speed and the attending short life of the tires, are not these factors in themselves sufficient reason for a determined effort on the part of manufacturers to squelch the speed craze?

LESSONS IN COURT CASES.

Must Turn Out Seasonably.—Where a pedestrian turned out from behind a big meat truck that was carrying a picnic party and saw a motor coming towards her fast on the wrong side of the street, when the plaintiff turned to the left to avoid the motor and the defendant turned the motor to the right and ran into her, it was held in a New York court that a verdict for the plaintiff was not against the weight of evidence, and the jury were correctly instructed that the rule of the road was for vehicles to pass each other on the left on overtaking and to the right on meeting. The court said: "Persons in their place of security and power in motor cars should remember that their rapid and close approach may make a person think he or she is about to be run over, when that may not be the case. They should turn out seasonably."

One-Half the Road.—Where plaintiff's horse and buggy met an automobile and the horse jumped into a ditch on the side of the road, causing injuries, it was held that the plaintiff's claim that the automobile was going at an excessive rate of speed was not sustained by the evidence. As to whether or not the driver of a car kept to the right gave plaintiff one-half of the road, the evidence was conflicting and was a question for the jury. "The fact that one does not give another the full one-half of a road, to which he is entitled, is not conclusive evidence of negligence." Iowa Code provides that one meeting another must give one-half of the road and rendering him liable for failure to do so was held to apply only when that failure results in damages.

Driver Must Be on the Alert.—A city ordinance required vehicles to take the right-hand side of the street. The defendant's auto turned out from the east side of Sixth Avenue, New York City, on account of an obstruction in the east side and was going up the west side. It was held that therefore it was his duty to be on the alert, use his eyes, his ears, his senses, exercise care and caution, to look carefully ahead and proceed with caution and also with reduced speed, unless he could see that there were no persons on the west side of the avenue, and no conditions demanding it, with whom he was liable to come in contact; and he was required to look for persons and vehicles hidden from his view by cars who were relying on the fast that there were no vehicles on the west side of the street, and that to proceed northerly at a rapid rate of speed would be negligence and dangerous. In this case a woman got out of a south bound car, and in going to the sidewalk was struck by an auto going north, either while she was walking to the sidewalk or stepping backward to avoid another auto going south.

Thoughtless Inattention.—Maine R. S. ch. 24, sec. 9, requires an automobile driver to stop and remain stationary to allow animals to pass on a signal from the driver of a horse. A man and his sister in a wagon met an automobile and signaled for it to stop, which was disregarded, but the automobile turned off into a driveway at a house. The driver of the wagon, supposing it would remain there, started ahead, when the driver of the automobile, claiming that the team had passed out of his mind, came out into the road in front of the horse, frightening him and causing personal injuries. It was held that "thoughtless inattention" on the part of the driver of the car was negligence. Judgment for plaintiff.

Crossing the Street.—Defendant was arrested in Minnesota for unlawfully driving an auto at a certain intersecting street crossing contrary to the terms of an ordinance which prohibited turning to the left until his vehicle should have passed beyond the center of the intersection. The ordinance authorized a driver on the street to cross the center line of the street within 100 feet of his objective point. It was held that this did not justify the turning at a corner inside the intersection point.

Driver Was Negligent.—In a recent case before the Appellate Division of the Supreme Court, in New York, it was held that where a train which collided with an automobile was in plain sight long enough to have enabled the chauffeur to shut off the power and bring the machine to a standstill before reaching the track, and at the rate of speed at which he was moving he could have stopped the car almost immediately, he was guilty of contributory negligence and could not recover from the railroad company. (Gaynor J. dissenting.)

Passing Cars.—As to whether the registration fee was a license or a tax was not decided in a recent court case in New Jersey, but was held to be an exercise of the police power. The court said that drivers of vehicles approaching one another from opposite directions should each keep to the right when passing, and when moving in the same direction the one in the rear should pass on the left, the one in front keeping to the right.

Ran Down a Bicyclist.—In a case recently tried in Rhode Island the defendant, driving an auto, ran down a bicyclist in front of him. It was held that he was guilty of negligence.

LESSONS FOR DRIVERS.

Carelessness or Ignorance Is Responsible for Accidents.

The bursting of a tire always demoralizes the movement of a car, and if it is going at a high speed it is likely to cause a serious accident. The disaster by which the well-known speed driver, Emmanuel Cedrino, lost his life was due to a bursted tire, and scores of other lives have been sacrificed to the same cause. At Lexington, Ky., recently a party consisting of two men, a woman and four children, were riding rather rapidly when a tire burst and caused the driver to lose control of the car for an instant, the machine plunging into a stone wall. The entire party were thrown out and the car was wrecked. All were more or less injured. It should be borne in mind that not only is a tire far more liable to burst when the car is going at high speed, but the liability to accident in case it does burst is increased several fold.

We hear frequently of cars "turning turtle." Now, cars don't turn turtle in the active sense—never—although they do in the passive meaning. In other words, cars are turned turtle, but they never turn of their own volition. For illustration, near Hackensack, N. J., recently, two automobiles were traveling the same way and abreast, something that should never be done. Then came another car from the opposite direction, and in turning out to avoid them, the car ran into the ditch and, of course, was "turned turtle." The car was pretty badly wrecked.

Here is another case, as reported in the press, the accident occurring near South Bend, Ind.: "A touring car carrying its owner and five others turned turtle and darted down an embankment, injuring most of the party." The facts are simply that the car was steered down an embankment and was overturned.

Occasionally accidents occur when gears are left enmesh after the motor is stopped. The other day a man ran his car into a garage in Chicago and stopped it with the second speed gear in mesh. Finally he returned with his wife and a woman friend. The two ladies got into the car, and the man, who usually starts his car from compression before getting into his seat, inserted the plug and advanced the spark. The car jumped forward, broke its way through the garage door, crossed the street, jumped the sidewalk on the opposite side, the left wheel bringing up against a brick wall, while the right wheel started down a basement stairs. The car owner jumped when the car started forward, and one of the women followed suit when the car reached the middle of the street. The other stuck to the car and received a severe shaking up.

When the news of this peculiar accident spread a movement was begun in Chicago among dealers to start a general crusade against leaving motors to run, whether gears are in mesh or not, and against leaving gears in mesh when the motor is stopped. Numerous accidents have occurred from both.

It hardly seems to require it, but evidently some car drivers need to be told that a car will not turn out of its own volition. In San Francisco, the other day, a car in which were two of the police force came to a head-on collision with a car containing women and children. The force of the impact wrecked the entire forward portions of both cars, but no one was either killed or fatally injured. And the excuse? Each driver thought the other would turn out!

A collision with more fatal results occurred in Providence, R. I., recently. A flattened tire necessitated stopping in the road in the evening for repair. The occupants were all out of the car and standing near. It is claimed that the rear light was burning brightly. Soon a big car was heard speeding up behind, and although there was plenty of room to pass, there was a collision and one man was killed and several other men and women were badly hurt. Of course, the grossest carelessness is manifest, but if the car that was being repaired, or rather which was having a tire replaced, had been out of the beaten track of the road entirely, there would have been no collision. No one has any business to occupy any portion of the highway for this or any other purpose, except that of travel. In stopping in the highway it is not enough that there should be room enough for a vehicle to pass; such moving vehicle has the right to the whole road. The general purpose of the highways and streets is for travel, either on foot by a pedestrian or in a vehicle propelled by power. No part of it is for use for any other purpose whatever. We are inclined to think that if a car stops in the highway for repair, or if left standing in the highway for any purpose whatsoever, and it is run into by another vehicle, the moving vehicle can claim damages. Yet how often we meet vehicles standing one-half in the highway and half in the ditch, "room to pass" being all that is given.

Drivers do not seem to have yet learned how to take curves in the road or street. Accidents from this cause are still far more frequent than is desirable or creditable to car drivers. One of the most serious this month is where two men were killed and four seriously injured in Brooklyn, the men all being wealthy and socially and politically prominent. It appears that in attempting to take a curve in the road at high speed the car skidded and came into collision with five great elm trees, finally coming to a standstill, only when a shapeless mass of twisted iron and steel. Quite likely the driver disengaged the clutch and applied the brake when turning, instead of checking the speed of the car by throttling, or at all events applying the brake before reaching the turn.

And, speaking of brakes, too many accidents still occur where the drivers claim that the "brake failed to work." Possibly this may be the case, and quite likely it may not in many cases. The brake failing to work is about the best excuse a careless driver can give, and he knows it. It takes the responsibility from him, where it almost invariably belongs, and places it upon the car, where it almost invariably does not belong. And if the brake does fail to work, who is usually responsible for it? The man who drives and cares for the car. If anyone imagines that a machine weighing more than a ton while being hurled along at the rate of forty or fifty miles an hour, can be stopped suddenly without disarranging the most efficient brake, he is not much of a mechanic.

Several accidents have likewise been reported this month, owing to horse-drawn vehicles just ahead, which have failed to give the automobile half the road when passing. For some reason not quite clear, drivers of heavy wagons and carts, and in some cases light vehicles, have an aversion to a car coming up behind them and passing. That such drivers hear the horn goes without saying, but they often pay little or no attention to it, and, failing to give half the road, the car is turned into the ditch in passing, and if the grade is steep, is likely to overturn. For not only can no vehicle be turned at a sharp angle without overturning, but the fact that it is being sharply deflected from its straight course gives it a strong tendency to tip over—"turn turtle," as is stated so often in the press.

Repair men should not forget that it is much easier to take a car apart than to reassemble it.

THE REPAIR SHOP

WHY NUTS COME OFF.

The Shocks They Endure and the Best Way to Make Them Stay On.

BY JAMES F. HOBART, M. E.

"How does a nut get loose?" If a bolt is screwed tight, iron to iron, why does not the friction of the nut prevent it from turning around? A nut is screwed home with a wrench 12 inches long and a force of 100 pounds is exerted on the end of the wrench to tighten the nut. When the nut is unscrewed it will require a pull of 100 pounds on the wrench to start the nut, yet how is it that the nut unscrews itself and the bolt becomes loose while the vehicle is running?

These are only a part of the queries which are constantly being put up by people who are not mechanics, and to whom the unscrewing of a firmly tightened bolt, by the vibration of a running vehicle or machine, is something they cannot understand—quite a mystery, and of great interest to them, hence the questions—fool questions, some mechanics call them, but the writer always had a good deal of respect for just such questions, and

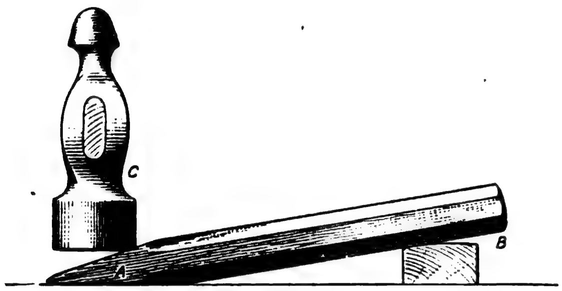


FIG. 1.—WHY NUTS COME OFF.

will go out of his way any time to answer such of them as he possesses a knowledge of. But it must be remembered that some questions asked by the laymen are things of such importance that the best informed engineers have hard work to frame a fitting reply.

For instance: When a recent purchaser of a car has his first ignition failure, and asks, "What is electricity, anyway?" he has asked a question which the scientists will hedge if possible, and if pressed for an answer the best they can reply is that electricity is evidently "a form of molecular motion, similar to light, heat and sound," and that is the very best reply you can get out of them.

When a man asks in all earnestness: "How and why does a nut get loose?" he has asked something which takes a little study to answer correctly. First, it should be kept in mind that a thread on a bolt is nothing but a wedge rolled up in circular form. As the books on physics put the matter, "the screw is an inclined plane wrapped around a cylinder." This being the case, a nut never can have a square bearing on the bolt, and, instead of studying why a nut works loose, we had better try and find out why a nut stays on at all under a load made up principally of blows and shocks more or less severe. ?

Try the little experiment illustrated by Fig. 1. Block up a cold chisel, A, on a bit of wood, and strike vertically with a small hammer on the incline of the chisel at C. Be sure to strike vertical blows in order that the experiment may be a fair one. If the blows are struck at right angles to the upper side of the chisel, instead of to the lower side, the chisel will move toward B much faster than when the blows are vertical, and the experiment is not a fair one. To prove that the constant tapping of a hammer on a bolt will cause the nut to work loose, try the

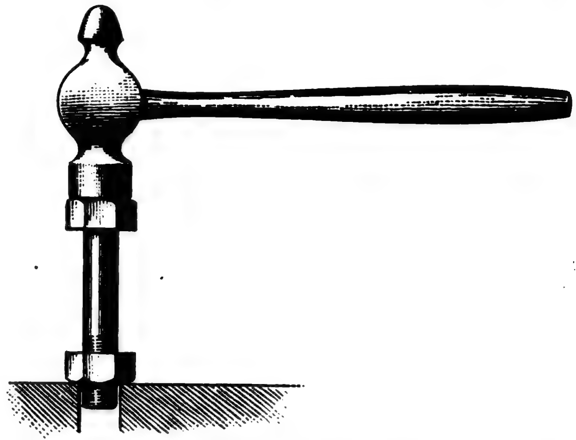


FIG. 2.—SCREWING UP A NUT WITH A HAMMER.

experiment illustrated by Fig. 2. Put a bolt over a hole in a piece of iron and hold the bolt by the nut so the body of the bolt is free to turn. Then strike with a hammer, as shown by the engraving, and note how the bolt turns slowly around in the nut. Strike light blows—they are just as good as heavy ones for the purpose of illustration, and it will soon be perceived that the bolt is turning very slowly in the nut.

The movement is slow, very slow, and it can hardly be seen even after a dozen blows have been struck. But after striking many blows, a perceptible motion of the bolt will be apparent. We may be very thankful indeed that the motion of the bolt is slow. If the bolt turned quickly, when struck with a hammer, we would be unable to even get away from home with our cars, to say nothing of getting home with them, so quickly would all the nuts and other screws become loose. Remember that the hammer-

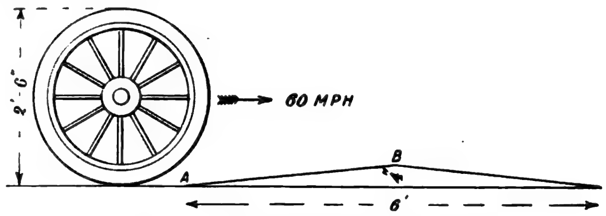


FIG. 3.—FORCE OF A ROAD BLOW.

ing to which bolts and nuts are subjected while in use is constant and long continued, being kept up at the rate of hundreds of blows a minute, for hours at a time. The nut tightens under the hammering, but in practice it loosens because the hammering is underneath the nut.

Besides from the blows due to roughness of roadbed—and these are very severe when a vehicle is running at high speed—there are to be carried by the bolts and nuts the unceasing shocks of the motor. The force of the blows struck by cylinder explosions is something terrific, and aside from being very heavy, the blows are long-continued and may be counted by the hundreds of thou-

sands. The vibrations of the motor, which become blows when transmitted to the running gear and the other machinery, are bad enough to contend with, and they are hard to be held by bolts and nuts, but these blows, destructive though they be, are as nothing to what is caused by high speeds on roads which are not perfectly smooth—and such roads do not exist—where every ridge becomes as of dynamite, and every pebble strikes a hundred-pound blow to the vehicle.

Suppose an automobile, with 30-inch tires, was running at 60 miles an hour and came to a water-table 4 inches high and 6 feet wide, tapering to the stated height from each side. The weight of the vehicle being 600 pounds

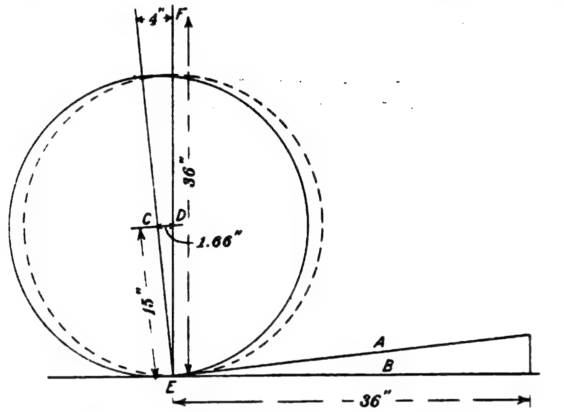


FIG. 4.—DURATION OF A ROAD BLOW.

on each wheel, and allowing one-half the blow to be absorbed by resilience of tires and wheel, springs, etc., what effect would running over the obstruction have upon the body of the vehicle? Fig. 3, gives an idea of the problem, and its manner of solution. The weight on one wheel of the vehicle is lifted 4 inches while going at the rate of 60 miles an hour. Allow one-half to be absorbed by the tire, although this is not exactly what should be assumed, but it is sufficiently accurate for our purpose.

The scientists tell us that the force developed by any body in motion, either by a change in the velocity or a change in direction, or by a loss of velocity of the body, is measured by the inertia of the body. Thus we may take the inertia of the body as equal to the power of that body, which is the force multiplied by the velocity. In this case, the velocity being 60 miles an hour, 1 mile a minute, or 5,280 divided by 60, equals 88 feet a second, and the force being the weight of the wheel, or 600 pounds; hence the power of the moving wheel is 88, multiplied by 600, equals 52,800 pounds. We cannot say that this quantity represents the amount of work the moving wheel is capable of doing, for the reason that no time exists in which the power acts. Power must act for a certain time to produce work, and in this case we can only consider it as acting in a straight line, as indicated by the arrow in Fig. 3.

Were the power to be considered as acting for 1 second, then the work would be the same as the power, but it is evident that the power does not continue to be applied at the beginning of the incline for more than a very small fraction of a second, because the wheel would travel the entire length of the 36-inch incline in 3-88 of one second. The actual time the power is being applied to doing work at the bottom of the incline A B, Fig 3, may perhaps be taken as the length of time which elapses between the actual touching of the incline by the tire and the arrival of the center of the wheel vertically over the top of the incline.

This matter is more clearly shown by Fig. 4, in which the full circle represents the wheel as its tire touches the incline, while the dotted circle represents the rim of the wheel when the center is vertically over the beginning of the incline. In these positions the centers of the wheel are indicated by C and D respectively, and the distance between these centers is the distance required to complete the calculations. If you care to calculate the angle made by the incline A with the horizontal line B, you will find that it is about 3 degrees and 35 minutes, but we do not care for the angle, in this calculation, owing to the fact that the angle between lines C and D is the same as between A and B.

Measuring off on line D, the same distance (36 inches) as laid down upon line B, it is found that the distance, E D, is 15-36 of the distance E F, therefore the distance apart of the centers, C D, must be 15-36 of 4, which equals 1.66 inches, or 0.133 foot. To ascertain the amount of work done in changing the direction of travel from B to grade A, it is only necessary to multiply the power, 52,800 pounds, by the time in which the work was expended, and the time required to travel .133 foot at 88 feet a second is .133 divided by 88 equals .00151 second; then the amount of work done at the angle is .00151 multiplied by 52,800, which equals 80 pounds, nearly, the blow struck by each wheel passing the "thank-ye-ma'm."

To the above must be added the weight of the wheel, making the tire press with a weight of 680 pounds against the incline as it reaches it. A man weighing 200 pounds would then be forced against the cushion with an additional force of about 26½ pounds when the wheels struck a 3½ degree grade, provided he was directly over either axle. The solution of the above problem was made for the writer by a mathematician supposedly well acquainted with such questions, but, while not criticising the accuracy of the calculations, the writer does not believe that 80 pounds is the correct answer to the problem, or that the proper method was followed, and requests readers to figure out the vertical stress when the wheels hit the grade, and let the editor know results.

Putting the matter in the same class as the pressure on steam engine cross-head guides, Nystrom gives the rule

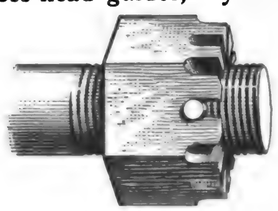


FIG. 5.—CROWN LOCK NUT.

as "multiply the force (pressure on the piston) by the tangent of the connecting rod angle. In this example the force is taken as 600 pounds, and the tangent of angle 3 degrees and 35 minutes is .062622, and 600 multiplied by .062622 equals 37.7 pounds, nearly. The writer does not believe that even this answer is the correct solution of the problem. But however that may be, it goes to show that a great strain is put upon each and every bolt in the automobile when the tires meet an obstruction at high speed. If the first calculation is correct, the wheel needs only to meet an obstruction a little less than 3-16 inch high to "go up in the air" as described. Allowing one-half to be absorbed by the tires and springs there still remains enough to hammer almost any nut off its bolt, especially when continued day after day and month after month.

The double or check nut is not a cure for the ill; check nuts are subject to the same hammering that single nuts must endure, and they are hammered loose in the same manner. About the only sure cure is the Crown nut, shown by Fig. 5. This nut, with a cotter through the bolt, will do the business until the cotter wears in two. Then put in a new cotter.

REPAINTING

Full Details for Doing the Work Easily and Satisfactorily.

BY M. C. HILLICK.

Repainting the motor car presents difficulties which are for the most part quite unknown in connection with the same work supplied to horse-drawn vehicles. Especially is the body surface subjected to so much excessive jolting, wrenching, and ugly contortions, that when it comes to the painter for a fresh application of paint and varnish there is much to do which, while seemingly unimportant, is, nevertheless, absolutely essential.

Perhaps the surface shows a noble display of fissures for the effectual elimination of which the owner is not prepared to pay, declining even the cost of applying rough stuff to the surface. To meet this condition and satisfy the customer, proceed as follows, bearing in mind the while, that the remedy is merely a substitute for necessary thoroughgoing processes:

Sandpaper the surface lightly to knock off the knobs and knuckles of dirt, if any. Then dust off thoroughly and flow on a generous coat of gold size japan. Permit this coat to dry thirty-six hours, and then run over it lightly with No. 0 sandpaper to kill the gloss and reduce any existing dirt motes. Then lay on the coat of color and proceed to a finish in the usual way. The gold size reaches into the minute orifices, filling and sealing them against suction and absorption of the following coats, at the same time affording a quick and comparatively inexpensive method of conditioning the surface to finish upon.

It may happen, too, that a split panel in the body shows, and in the absence of the woodworker, bore a ¼-inch hole at each end of the fracture, putting one hole just at the end, and connecting with the crack, and the other one quite clear of it. Next plug the holes up and dress off perfectly even and true with the surface. Follow this by cutting a shallow bevel on both sides of the crevice and parallel with it, by this method giving the putty, when applied, opportunity to resist the cracking tendency of the fissure. Now give the dressed off part of the wood a good coat of oil lead. Give this lead three days to dry right, after which putty the cavity with a pigment made up of ¼ keg lead, ¼ best bolted whiting, and ½ dry white lead, kneaded to proper consistency in equal parts of rubbing varnish and coach japan. After thirty-six hours reputty the mended surface, and after another thirty-six hours rub the hard mass to a perfect level with the surrounding surface with a piece of rubbing stone dipped in raw linseed oil. Then carry forward the customary painting and finishing processes.

It not infrequently happens that the painter gets a smear of paint, or grease, or stain, on the cloth lining of the car, or at least finds one or more there, in which case dampen the goods with refined gasoline, and rub briskly with a clean woollen cloth. If the spots are detected while the smear is still wet, procure, if possible, pieces of the same kind of cloth of which the lining is composed and rub smartly cloth to cloth. This is an effective treatment and possesses the merit of being simple.

The big limousines after painting and finishing furnish plenty of window glass to be cleaned, to accomplish which saturate a soft sponge with two parts denatured alcohol and one part water, and apply to the glass, using a putty knife ground sharp on one side of the blade to loosen and cut away any hard pigment located along the edge of the glass. If there are any especially hard daubs of pigment which do not yield readily to the knife or alcohol, wet them up with oxalic acid. Use a clean, white cloth, free from lint, to polish the glass with, and follow by rubbing with a roll of soft paper, upon which has been dusted a pinch of dry refined lampblack.

Upon these same limousines, and other classes of cars, for that matter, which are furnished with doors, it is excellent practice to finish the jambs and pillars and other parts that are likely to stick through surface contact, in a polished rather than in an ordinary varnished state.

Bring the parts up with a strong, rich foundation of rubbing varnish, which, when at last thoroughly dry, rub with water and No. 00 pulverized pumice stone. Then procure some good varnish polish and proceed to bring the dull rubbed surface to a fine, rich lustre which neither sticks through contact with another surface or mars readily. In point of fact, this is an ideal finish for the parts in question.

CAR TROUBLES.

How to Eliminate or Repair Some of the Common Difficulties.

Recently a letter was sent out to the heads of the mechanical departments of several automobile factories asking how best a car may be cared for and handled to avoid trouble, and the following are some of the replies:

Packard Motor Car Company:

"The mistake which most frequently sends the car to the repair shop is lack of attention to proper lubrication. A great variety of troubles are directly caused by this. The second cause is careless driving."

The Cadillac Motor Car Company replies as follows: "The failure to give attention to the lubricating system causes the most trouble. When oil is not supplied working parts are liable to wear and in a few minutes may cut up the metal so badly as to cause a lot of damage. Dirty gasoline often causes trouble. All gasoline should be carefully strained through a chamois skin as it is poured into the tank. Dirt in the water circulation system often causes trouble. In one case we found the remains of a cigar in the pump strainer. Use clean water and do not remove the strainer at the top of the radiator, even if the water will flow more quickly. Allowing the storage batteries to become exhausted or to stand uncharged for long periods will cause trouble.

"Another thing is not using the proper anti-freeze solution, or putting it in early enough in the year. Pure water, of course, is almost certain to freeze and ruin part of the engine."

The Dayton Motor Car Company says: "More than 95 per cent. of the troubles experienced by novices is caused by carelessness and ignorance. New drivers are careless in changing gears; they do not release the clutch properly, but try to force the gears into place, thereby damaging them; then, after the gear has been changed, the clutch is dropped suddenly, throwing a great strain on the power plant, transmission, and rear axle. The clutch should be thrown entirely out, the gear changed with a firm stroke, and the clutch should then be fed into the fly-wheel carefully, allowing it to gain the same momentum as the engine before being let entirely in. Careful attention should be paid to oiling the clutch hub and bearings.

"Motor troubles are invariably caused by improper lubrication. Get the best oil obtainable and use plenty of it. No need to waste it, but too much is better than too little. Too little will eventually ruin the motor. Too much makes dirty spark plugs and carbon deposits in cylinders and on valves, all of which goes to make the motor run hot and pound.

"Brakes are seldom given the attention they deserve. Shafts are never oiled, and when the time comes—and it will surely come to every one who owns a car—to have an efficient brake for an emergency, he will find that his negligence has cost him an accident. Accidents caused by defective steering gears are invariably traceable to neglect on part of driver. All bearings should be kept tight and well oiled, and all connections adjusted.

"Ignition coils need adjusting. Spark plugs need cleaning. Batteries should be kept up to their proper voltage. When a motor misses try adjusting the coil. If this does not remedy the trouble test out the batteries. Carbureters, when properly adjusted, should be left alone, except in cases of flooding, when the dirt which prevents the valve from seating should be cleahed out. Too many drivers drive with a late spark and do not depend on the throttle to control their speeds. The spark lever is just as important as the throttle and should be used. A large portion of motor heating is caused by too much gasoline and too late a spark."

The Maxwell-Briscoe Motor Company replies that: "The man who knows enough of dry-cell battery to understand whether connections are properly made or not, and is capable of following the wiring of his ignition system in tracing a short circuit, will not be much terrified by ignition trouble—the most fruitful source of the motorist's labors at the roadside. If, in addition, he has learned enough of the inwards of his motor to locate an occasional compression leak, and if he is not afraid to tackle a punctured pneumatic tire, nothing more than a reasonably close attention to the lubrication will be required to render the motorist's visits to the repair shop few and far between.

"It is safe to err on the side of over-lubrication, for while this extreme may produce a sooted spark plug and much ill-savoring smoke, under-lubrication is bound to lead the engine to ultimate and untimely breakdown."

The White Company says: "Because a White car may be allowed to run for some time without the proper care that it should receive, the owner is apt to let it go. This results in the car becoming less and less efficient. If it were arranged like a gasoline explosive engine when the wire fell off the spark plug or the valves got so dirty that there was no compression, the automobile would stop, but in a steam car, although every stuffing-box may leak and for the lack of oil the valves may be badly cut, still the automobile will run—all of which is liable to make the owner careless.

"The actual operation of the White car is extremely simple; the opening and shutting of the throttle give the various speeds of from one to fifty miles an hour. However, if you apply the 50-miles-an-hour power to the engine immediately on starting it up, by yanking your throttle open, it means a tremendous strain upon the engine."

The head of the repair department of the E. R. Thomas Detroit Company says: "The most common error is neglecting lubrication of small parts. Nearly everyone will see that the motor is given its regular quota of oil and that the transmission and rear axle are properly filled, but the lubrication of such things as fan, front wheel, steering connection, spring link, and various lever bearings is entirely lost sight of. Manufacturers place attractive brass oil and grease cups at all important points of the car, where it is practicable to do so, in the hope that they will be noticed and used, but in too many instances the result is not attained. Not only is lubrication neglected, but a cheap oil is used merely to save a few cents per gallon. This one thing often results in repairs of a very expensive nature.

"Owners are constantly acting on advice given by anyone and everyone. For instance, one man was told to pour kerosene in the cylinders every night. He followed the advice, with the result that when he started his car next morning the pistons were dry, and scoring resulted before the proper amount of oil was delivered to remedy this condition. The man who advised it forgot to tell him to run his motor slowly on no load for several minutes before starting the car. Another man was advised to drill a hole in the commutator cover for the purpose of making lubrication easy. This was done, with the result that dirt soon put the instrument entirely out of commission. These are merely instances where an owner will take the word of a man who probably knows nothing except what he has heard, against the results of years of careful work and experiment in manufacturing on the part of the designer of the car.

"There are thousands of cars that land in a repair shop every day, probably going there at the end of a rope, merely because the owner expects his car to run all day, seven days out of every week, with no attention to adjustments. The twist, jar and strain which cars are constantly subjected to on roads, and even on some streets, would relegate a railroad locomotive to the scrap heap inside of the life of an automobile.

"On the other hand, there are other thousands of owners who know the machine, who become as familiar with it as with the details of their own business. These men can detect any illness of the car at its beginning, can locate a rattle or pound, and if not actually able to overcome it themselves, will have the work done promptly."

The Gearless Transmission Company gives the following list of avoidable troubles and their causes:

"The proper application of oil and grease to all parts that have friction.

"On new cars the oil can is the best tool in the kit; after a run of, say 50 miles, examine all the parts subject to friction and don't forget such parts as the spring links.

"In oiling the car thoroughly, loose nuts and bolts are often discovered, thereby lessening the liability of severe breakages and accidents.

"The owners of cars very often rely upon chauffeurs, whose knowledge of things mechanical is limited. The mere driving of a car is a simple proposition compared with the proper mechanical upkeep. All chauffeurs should be able to know when repairs are properly executed, and they should not rely too much on the repair man, as the latter will very often, through inability, slight repairs. A thorough machinist is the best man for these jobs.

"The slipping of the gears with noise is one of the annoyances commonly met with by poor operators.

"The liner shaft, upon which the clutch is mounted, should revolve perfectly free when the clutch is thrown out free from the fly-wheel, thereby reducing inertia of clutch, allowing more perfect freedom for slipping of gears.

"Too rapid acceleration of spark, producing sudden shocks on driving mechanism.

"Placing of short sprag bars on frame across members instead of a long one on a side rail of main frame.

"Sprag bars placed at too much of an angle with the ground, causing their action to lift the car instead of stopping its lateral movement.

"Allowing motor to run too fast for a considerable length of time while car is standing still.

"Allowing gasoline strainer on gasoline pipe to carbureter to fill with dirt caused by not straining gasoline when filling tank.

"Infrequent washing out of water system to remove lime and dirt.

"Filling the cooling system with foul water, thereby choking cooler.

"Allowing too much back lash in steering gear system and not giving it frequent examination.

"Trying to turn corners on two wheels instead of four.

"Lack of grease or oil in the timer, causing contacts to wear, thereby making bad contact.

"Not keeping storage batteries properly charged.

"Allowing coil to get wet.

"Advancing timer too far under a heavy load.

"The use of cheap wire in wiring system.

"The use of muriatic acid in soldering wires instead of a paste made for the purpose.

"Allowing contacts on coil to become pitted, causing them to stick.

"Opening of water cock in cold weather to drain water system and not observing that the water is passing through them."

The Stevens-Duryea Company says:

"One of the most serious mistakes made by the owners to whom the automobile is a new proposition, is that they fail to realize that a little cold greatly affects the carbureter and engine. Upon starting the motor in cold weather, or even on a chilly spring or fall morning, it will usually run stiffly, skipping now and then, until it is thoroughly warmed up. The automobile at once takes this as a prelude to some dangerous motor oil, and therefore starts on a tour of investigation. The object of these experiments is usually the much-abused carbureter, and in a few moments he has this delicate piece of mechanism entirely out of adjustment. As a result of this faulty adjustment, the engine is either given too rich a mixture, in which case soot is rapidly deposited in the cylinder to cause trouble afterward, or else too thin a mixture, causing a great loss of power and in consequence making necessary constant recourse to gear shifting with its attendant wear on both engine and gears.

"Sometimes the engine is dosed with more oil in the hopes of making it run smoother, and this excess of oil is very bad for the motor, as it forms a carbon deposit on the piston, the deposit ultimately hardening and causing overheating. All this trouble could have been avoided by simply allowing the motor to warm up.

"The purchaser of an automobile is usually cautioned about the oiling of a car, but it is astonishing how many times this vital motor need is neglected. Lack of oiling in any part of the car means friction and friction means undue wear. The very best grade of oil should be used. Some oil contains a very large percentage of acid which sooner or later eats into the steel.

"Some drivers make use of the following very harmful practice: If the car is seen to be unable to take the hill on the high gear, the clutch is thrown out just before the engine is stalled, the engine speeded up and the clutch let in again in order to avoid shifting to second speed. The engine is running at high speed and the car is barely moving, and the great shock and friction when the clutch takes hold results, in most instances, in the burning out of the clutch. In any case, however, the whole mechanism is subjected to a great strain.

"In a multiple-cylinder motor, no cylinder should be allowed to skip or miss fire for any length of time, as this results in an irregular strain on the crank-shaft."

A good test of the condition of a motor is to run it as slowly as possible, observing whether its action is perfectly even.

IGNITION WIRING.

For Single and Double Cylinders and Various Other Connections.

BY JAMES F. HOBART, M. F.

In wiring for the "make and break," or "wipe" spark, it is necessary that the current be sent through the internal contacts at the time the explosion is desired. The sudden pulling apart of the contacts inside the cylinder does the timing, and a motor would ignite well with no other appliance for timing the current. But such an arrangement would not be profitable, for the reason that current would be "on" all the time and the battery wear would be immense. It is, then, necessary when the wipe spark is used, to use some sort of contact making device which will cause the current to flow through the spark coil and contact breaker only long enough before the break comes to insure the full energizing of the spark-coil. Thus, in reality, a "timer" is necessary with a wipe spark ignition arrangement as well as with a jump-spark outfit.

WIRING FOR A SINGLE CYLINDFR MOTOR.

In connecting up a single cylinder with touch or wipe spark, it is necessary to make the connections as shown by Fig. 1, sketch A, where a, a, a represent the cells of

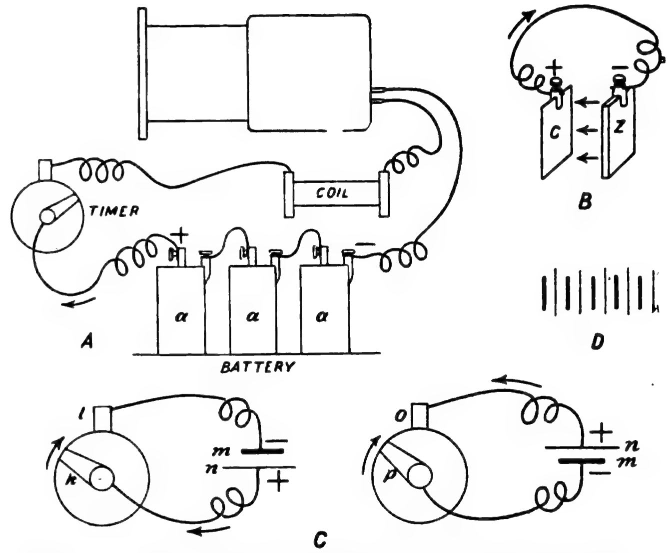


FIG. 1.—SINGLE CYLINDER WIRING FOR TOUCH SPARK.

battery or other source of electrical energy. In connecting up cells always put the copper pole to the work, for the "juice" always leaves a battery by the copper or carbon terminal and comes back again through the zinc end. Thus, if the carbon side of the battery be connected to the spark plug, the current will pass direct to the ignition point and back to the battery through its grounded terminal. If, on the other hand, the zinc terminal of the battery is connected to the timer and the sparking device, then the current must pass through the grounded wire, thence back through the sparking device—a roundabout way.

Sketch B shows the direction of travel taken by the current in one cell of a battery. The thick plate, marked Z, is the zinc plate. This plate is consumed by electrolytic action, while the other, marked C, the copper or carbon plate, is not worn away, and, in some cases, particularly with gravity battery work, it increases in weight. It will be noted that the zinc plate is marked negative, yet it is really the positive plate, being the one from which the current passes into the liquid of the battery. The negative plate is the one which receives current from the liquid.

The plate from which current passes through the liquid is the one which is always corroded or eaten away.

POSITIVE PLATE THE NEGATIVE POLE.

One cause of confusion in battery connecting is the fact that while the zinc of a cell is the positive plate, its terminal is not the positive pole by any means. As the current passes from the zinc plate into the liquid of the cell it becomes the positive plate because it exudes electricity, so to speak. If we attach a binding post to the zinc plate and connect it by means of a wire to a similar binding post on the carbon plate, then the current passes through the wire from the copper to the zinc plate. The zinc plate is now receiving the current through the terminal which has been attached to it, while the copper or carbon plate is sending out the current through its terminal. The terminal of the copper or carbon plate must therefore be marked +, or positive, while the terminal attached to the zinc plate is marked —, or negative. Thus, in any cell or battery, the positive terminal, or pole, is the one which is attached to the carbon. The negative pole or terminal is that which is attached to the zinc. Therefore always remember that the current must come out of the carbon end of a cell—if it comes out at all—and attach that end of any cell, or collection of cells, which is called a "battery," to the wire which leads to the timer and spark plug. The zinc end of any battery should be grounded, provided a machine grounded circuit is used.

In the sketches at C two methods of connecting up the timer of an engine are shown, the parts being shown diagrammatically for clearness. In the diagram at the left the zinc plate m is shown as connected with the timer brush, while the carbon n is attached to the commutator segment k. As a result of this arrangement, when k and l are in contact, current will flow from the positive terminal n, through segment k, brush l and back again to the zinc plate m.

Plate m is eaten up by the current, leaving that plate and tearing away the zinc. In the same manner, should l and k separate while the current is passing through them, some of segment k will be torn off by the current as it passes from k to l.

At o and p, of the right diagram, the battery connections have been made in the opposite manner, and the current passes from brush o to segment p, the position of battery plates m and n having been reversed so as to force the current in the direction indicated. By this arrangement, brush o will be burned away, while segment p will remain almost intact. Thus, the automobile man always has it in his power to elect whether the brush shall be burned away and the timer segment saved, or whether he will let the segment suffer while the easily replaced brush remains as good as new. This matter should be kept in mind when connecting up timers and other commutator arrangements.

One other point should be remembered: When a battery is represented in a diagram by a number of parallel lines, as in sketch D, it is to be understood that the thick plates are the zincs. They are the thickest so they can stand lots of wear. The carbons are thin—they do not wear out or burn away. Thus is a clew given to the direction of current in the diagram, which is the conventional symbol for a battery.

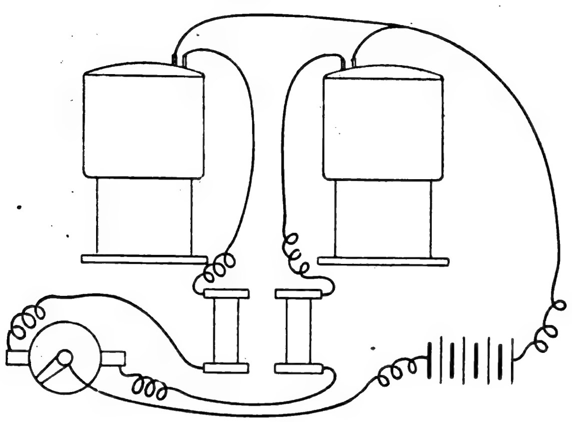


FIG. 2.—DOUBLE CYLINDER WIRING FOR TOUCH SPARK.

"TOUCH" WIRING FOR A DOUBLE CYLINDER.

When two cylinders are to be wired for "touch" ignition, there are two ways of connecting up, as shown by Fig. 2, sketches E and F. The former shows the proper method when two spark coils are to be used, while sketch F shows how to fire two cylinders with a single spark coil. When the engine is to run comparatively slow, the latter method will answer, but when the engine runs so fast that there is no time for the coil to become fully energized, then two coils may be used, as in sketch E.

When four cylinders are used, or when two two-stroke-cycle cylinders are to be ignited, it may be necessary to double up, as shown by sketch F, which shows the matter so plainly that no further description is necessary, except that the timer must have a brush for each cylinder to be ignited. This matter is more important with the jump spark ignition. It is only necessary here to so adjust the brushes that the current is surely in the various circuits at the times when ignition is wanted in the several cylinders.

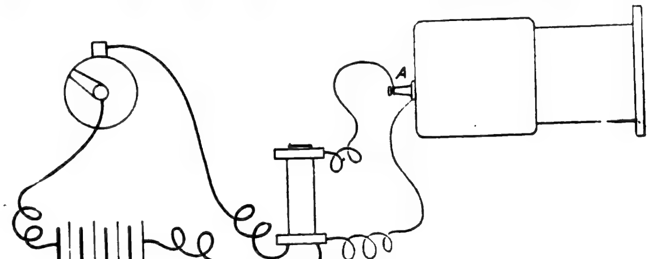


FIG. 3.—JUMP SPARK WIRING FOR A SINGLE CYLINDER.

"JUMP" SPARK WIRING FOR A SINGLE CYLINDER.

When the "jump" spark is to be used, the same timer arrangement is necessary. Upon the instant of admitting the current to the several coils depends the point of firing, while with the touch spark this is controlled by the time of breaking contact inside the cylinder. For a single cylinder the wiring may be as illustrated by Fig. 3, and it

will be seen to be almost identical with the arrangement shown by sketch A, Fig. 1, except that the primary circuit is returned to the battery from the coil, while a secondary circuit is used for connecting up the spark plug, A.

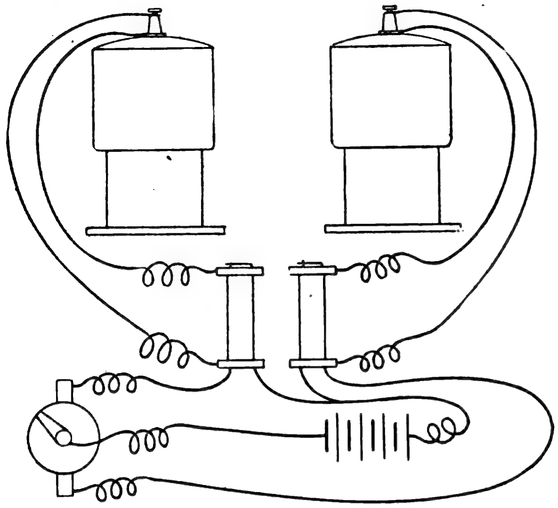


FIG. 5.—TWO-CYLINDER, JUMP SPARK WITH GROUNDED WIRE.

In this arrangement ignition should come the instant the timer-segment and brush touch each other. In well arranged coils the ignition comes the first time the primary circuit is broken by the buzzer on the end of the box coil. Should the spark thus made fail to explode the charge, the next spark has a chance at it; but as each succeeding spark is later than its predecessor, it is important to have the first one do the business.

DOUBLE CYLINDER JUMP SPARK WIRING.

To wire for a second cylinder, whether opposed or at right angles to the first cylinder, it is only necessary to add another brush to the timer, another box coil and connect up the second cylinder, as shown by Fig 4. Both primary connections are to be returned to the battery, and

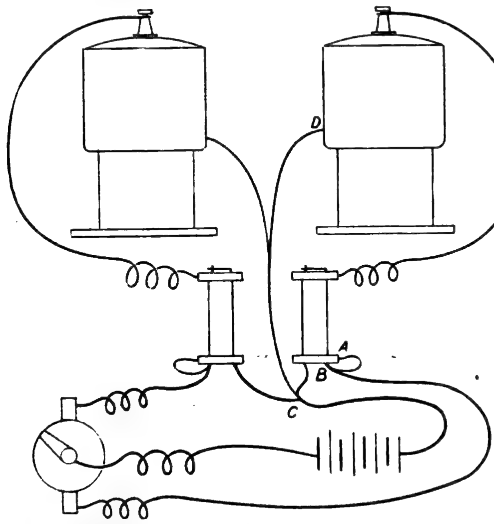


FIG. 4.—JUMP SPARK WIRING FOR TWO CYLINDERS.

the secondary return wire may also be single instead of double; but the writer much prefers to use separate connections and connect each plug direct with its coil, instead of running a common wire, as is frequently done.

There are two things which are hard to hold under pressure, and they are gasoline and electricity. It is a toss-up as to which will "sneak" away when under high pressure, but it is no joke to say that both will do it to perfection. Therefore, make connections for both gasoline and electricity as plain, straight and simple as possible.

"GROUNDED" WIRING.

Some automobile motors are connected up with a single wire, the returns being all "grounded" into the frame of the engine at any convenient point, both primary and secondary currents using the same return wire. A wiring scheme of this kind is shown by Fig. 5, where the secondary of each coil is connected, as shown at A B, with the primary wire. The return is connected with the battery at C and to some portion of the engine frame, as at D. Each of the spark plugs is screwed solid into electrical contact with its cylinder, only the central plug being insulated, the cylinder forming the return for the secondary current until wire D is reached. There is also a method of "distributing" secondary current to several plugs from a single box coil.

DISTRIBUTING SECONDARY CURRENT.

As shown by Fig. 6, the "distributing" method consists of a commutator (another timer will do) inserted between the coil and the several cylinder plugs. If required, the timer and the distributor may be mounted, together

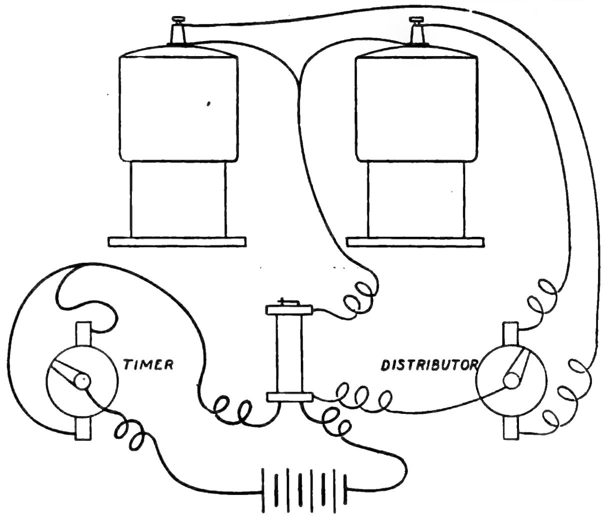


FIG. 6.—DISTRIBUTING SECONDARY CURRENT.

with the exhaust valve opening mechanism, and all worked upon the same shaft. It must be born in mind that the arrangement for opposed motors and for parallel cylinders is the same, with the exception that the brushes are to be put into the timer and the distributor (if unfortunate enough to have one) in such a manner that current is led to each cylinder at the time an explosion is required.

The wiring shown by Fig. 6 includes the insulated return, no grounding being permitted; but if it is desired to ground both primary and secondary circuits, it may be done by connecting the returns as in Fig. 5. When speeding up the motors the timer and the distributor must both be so advanced that the distributor is never in the act of passing its brushes on or off the commutator segment when the current is flowing. If this is attempted there will be a spark at the distributor instead of at the plug.

Reckless Tire Waste.

If it were possible to design an indicator which would show in dollars and cents the effect on tires of taking corners too fast, or of jamming brakes on to their fullest extent, car owners would get a bit of a shock. The expense they were incurring by such reckless and ignorant driving would come home to them with full force. The final collapse of their tires after a few weeks or months, as the case may be, could never have the same effect. They are inclined to attribute the result to bad luck, faulty tires or some other cause not directly within their control.

TROUBLE DEPARTMENT.

Under this head are questions and when possible, replies to them. Our readers will appreciate the importance to inquirers of furnishing the desired information promptly.

This department is intended to be a "trouble clearing house," and it will be esteemed a favor if our readers will add information to it from their own experience or knowledge.

Are the Makers Responsible?

From H. D. K., New York.—Last January I bought a new touring car in a neighboring city, and after driving the car home I drew off the water as the condition of the roads here during the winter are such that the use of a machine is impossible. When I started to use the machine this spring, I attempted to fill the water tank, and found soon that the water was spurting in every direction from the cylinders. On examining the cylinders I found the lower part of the cylinders and the petcocks were packed full of core sand. I know they were free when I first began to draw off the water last winter, for I was not sure which was the water drip and which the relief cock and so in each case I waited until the water had started. I presume this sand gradually washed down into the bottom of the cylinder and so caused the stoppage. Do you consider that these cylinders were thoroughly sand blasted and inspected before the car was shipped, and further do you consider that the makers of the machine could be held responsible for the accident?

Wear of Tires.

From Ed. Miller, Missouri.—I have been using a set of tires which the makers said would last for use at least 3,000 miles, and yet I have only driven them about 2,000 miles and they are about worn out. I am now thinking of getting solid tires. Would you advise me to do so?

Reply—If you intend to drive slow and carefully, you will probably be satisfied with cushion tires. One of their worst failings is that they have a tendency to shake up the machinery of the car. The wear of pneumatic tires depends much upon the driver. The sudden application of the brake brings a greater strain upon the rear tires than many miles of driving. Rounding a curve rapidly also brings a severe strain upon them—both front and rear. Then there is insufficient inflation. This is bad for the tires. If you have surface cuts repaired as soon as practicable after they appear, it will save your tires. It is up to the driver whether tires run 1,000 miles or four times that distance. Possibly we may remark here that the car may run as easily with the tires inflated rather soft as if they are hard, but they last better and are far less liable to damage when inflated hard. Speed likewise wears out and destroys tires.

Planetary and Friction.

Reader, North Carolina.—What is a planetary transmission, and will you please tell me what you think of the friction drive?

Reply—Briefly, a planetary transmission is one in which the gears revolve around the shaft at the same time revolving on their own axis. The friction drive works far better than wiseacres predicted. Its simplicity and the unlimited changes of speed strongly recommend it. The Motor Car Company, makers of the Carter car, which use this system, and have done so long enough to give it all kinds of prolonged tests, find it necessary to run night and day to supply the demand for their cars.

To Tighten Joints.

From A. H., New York—It may please some of your readers to know that common washing soap makes a gasoline joint tight. As gasoline penetrates almost any crevice, application of a film of fresh soap inside or outside the joint may save a lot of annoyance. The same applied to the ordinary Schrader air valve that leaks will do for quite a while. Try it, fellow trouble menders. Take the valve out and apply the soap to the seat.

It may also interest some economical inclined car owners that the ordinary aqua ammonia sold in groceries at 5 or 10 cents per bottle, to which common whiting is added in proportion to make a thin cream, will clean brass work about as well as any of the polishes sold, though possibly will not retain the brilliancy as long. It occurs to writer that a formula for an inexpensive lasting polish must be in possession of some of your readers, and a perusal of the same would be appreciated by others.

Cars of earlier pattern are susceptible of modern improvements, as is evidenced by a Ford model A built in 1903, in the writer's possession, which can still make 17 miles per hour, carry four people and average about 12 miles per gallon of gasoline. With perhaps some needed replacements and "refinements" by one who understands the requirements better than the writer, this performance can undoubedly be surpassed.

Filtering Oil.

From William B. Riggs, Connecticut.—Can you give me a good method of filtering waste oil. I know that filters can be bought but they are expensive. Is there any home made filter that will answer the purpose?

Reply—To filter waste oil when time is no object, a few layers of felt are necessary. In some cases several small ten pound butter boxes have been used to advantage. Take the bottoms out and nail on quarter-inch felt instead. Set about four boxes, one on top of the other, and pour the oil in at the top. When the oil has flowed through the three felts it will be thoroughly filtered.

A Pounding Cadillac.

From George Denio, New York.—I see by your valuable paper that a good many people get help in their troubles, by asking for it. I have a model M, Cadillac, 1906 make, and it has developed a habit of pounding. I have written the makers, and had several repair men try to locate the trouble without success. It will run nicely standing still, but the moment you call for labor, it will pound and the harder it works the greater the trouble. With the spark clear back it does very well but then you get no power, and if you advance the spark the trouble begins. I hope some one can tell me what to do.

Life of Dry Battery Cells.

W. F. G., Pennsylvania.—The cells of my dry battery run out frequently. Is there any way to prolong their life?

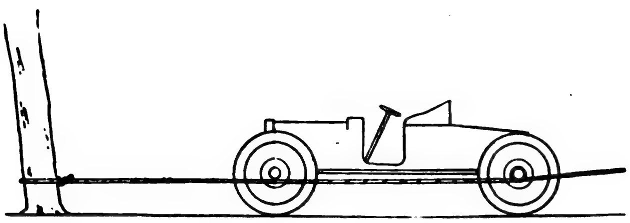
Reply.—You cannot get more out of anything than there is in it, but if you put the dry cells packed tightly in a case and free from moisture and heat you will probably have better success and longer service.

A French judge recently ruled that men learning to drive cars should keep in the open country until they are proficient.

An aluminum-cobalt alloy has been invented by a French engineer which possesses great resistance, yet is very light.

For Slipping Wheels.

Possibly most of our readers are familiar with the illustration as a means of overcoming the slipping of wheels on a steep grade, but it is given herewith at the request of



a reader. All that is needed is a stout rope, something to tie it to, and someone to keep up the tension on the slack end of the rope. In case there is no tree handy, a stout stake may be driven into the ground, to which the rope may be attached.

Straining the Front Wheels.

Sometimes the front tire will wear abnormally, and the blame may be put upon the tire manufacturer, while it is really due to the wheels running out of parallel, and consequently there is rubbing on the ground as well as rolling. With a car of good manufacture this may be thought an impossibility, but this is not the case if the car has been badly handled in daily use. One frequently sees a garage attendant move a car from one place to another, wrenching the front wheels round by means of the steering wheel with the car stationary. As the steering gear enables one to put a great deal of power into turning the front wheels, the stress on the steering arms is very great, and consequently they are liable to be bent, and, in fact, do become bent out of shape, with much handling in this manner. Attention has very often been called to the ill-effects resulting from straining the front wheels with the steering gear wheel when the car is stationary, and it is a practice which should never be allowed under any circumstances. Although steering gears are called irreversible, and they are so as a rule, the front wheels can generally be taken in both hands and pulled across to the required angle, especially if the steering wheel be set over in the right direction. This, of course, does not strain the arms in the least.

Warning Sounds.

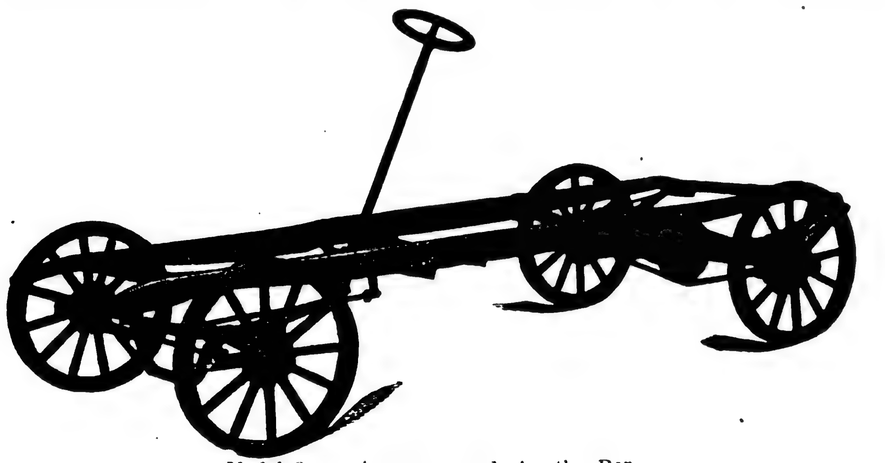
Popping in the carbureter indicates not enough gasoline for the amount of air introduced into the chamber. Firing in the muffler indicates that the cylinders are firing irregularly, and unfired charges pass through the exhaust pipe into the muffler, being ignited there by the heat of the next explosion. A weak battery is sometimes the cause of this.

When about to start on long runs, especially over rough country, it is a good scheme to see to it that the tail light is secure. Continual jouncing often loosens the nuts and lets the lamp drop off.

The merits of the American-made car received a significant demonstration recently, when a wealthy Philadelphian sold two foreign machines and purchased three built in a factory near his home.

CARS READY FOR POWER.

Illustrated herewith are two rather interesting products of the Borbein Auto Co., of St. Louis, Mo., a car body and a running gear, from which it would seem to be easy to make a complete car. The body is 34 inches wide and 86 inches long at bottom, but they are made in any size, and they also make all kinds of touring car or roadster bodies. They have an up-to-date body department with the latest improved machinery, and build these bodies with ash wood frames and poplar panels. Some are made of sheet steel, and they also make bodies with aluminum seats. Upholstering and painting is furnished, if desired.



Model 8 running gear made by the Borbein Auto Co.

The second illustration shows Model 8, pressed steel frame running gear, with a shaft drive rear axle. The front axle is 1½ inches square, bent down as much as desired to make room for the motor. The rear axle is shaft driven and of the latest improved style, with rollers at four points. The bevel gears are hardened, and are furnished with ratio 2½, 3 or 3½ to 1. The frame is made of pressed steel, hung on A grade oil-tempered semi-elliptic springs, with wrought steel hangers. The positive wheel steering device is fitted on the frame and connected to the front axle. They make this running gear with any wheel base desired, also any height of wheels for any style of pneumatic tires desired. The firm also furnish running gears with angle iron frames, with single or double chain drive, for any wheel base desired. In addition to roadster and touring cars they also make sight-seeing cars and 'buses ready for power.

For further information address the manufacturers, the Borbein Auto Co., 2109-2111 North Ninth street, St. Louis, Mo. Mention the AUTOMOBILE DEALER AND REPAIRER.

One style of body made by the Borbein Auto Co.

THE "BOILERLESS" STEAM VULCANIZER.—This device is manufactured by the Wishart-Burge Machine Works, 64 South Canal street, Chicago, Ill. Their advertisement will be found on another page. Write to them for further particulars, mentioning the AUTOMOBILE DEALER AND REPAIRER.

AUTOMOBILE TANKS.—In this issue will be found the advertisement of the Wilson & Friend Company, 3136 South Canal street, Chicago, Ill., with an illustration showing how their tank can be used to advantage. But write to them for further particulars and prices and mention the AUTOMOBILE DEALER AND REPAIRER.

"SAVE YOUR CAR."—This is the heading to the advertisement of the Supplementary Spiral Spring Company, Incorporated, 4522 Delmar avenue, St. Louis, Mo., in this issue. Every owner of an auto who has not investigated the merits of the Supplementary Spiral Springs made by this company will perhaps find it greatly to his interest to do so at once. One man writes to the company that he has ridden 100,000 miles without breaking a spring. Another writes that he cannot praise them enough. But consult the advertisement, and in writing for further particulars mention the AUTOMOBILE DEALER AND REPAIRER.

BALL BEARINGS.—The Pressed Steel Manufacturing Company, 454 The Bourse, Philadelphia, Pa., have an announcement in this issue which will interest many of our readers. But consult it and write for sample.

A POWERFUL SPARK PLUG.

Of course, every reader is interested in spark plugs, and, therefore, they will be interested in the Cleveland Spark Plug, illustrated in this connection. It is the hot spark that does the business, and the manufacturers say the Cleveland Spark Plug not only sparks but "shoots a flame" right into the mixture, causing instant detonation of the entire charge and giving magneto effects with ordinary batteries and still more powerful results with magnetos. The spiral core makes this plug, it is stated, really proof against short-circuiting, since it positively prevents the deposit of carbon on the insulation surface.

Many make the mistake of thinking that because their cylinders fire regularly, everything is O. K. But this is not necessarily so, as partly carbonized plugs allow the escape of electricity, causing weak ignition and loss of power long before they commence misfiring. As the Cleveland Spark Plug cannot carbonize, this means maximum energy all the time. Experts agree that poor ignition causes great falling off in power, and the heart of the ignition is the plug. A plug that is but a gap for the spark to jump across is not sufficient, for the spark is the life of the motor, and the way a plug sparks in the open air is no indication whatever of what is taking place inside the cylinder under compression.

The Cleveland Spark Plug is expensive to construct, but the motorist is rapidly realizing that it is poor policy

Cleveland Spark Plug.

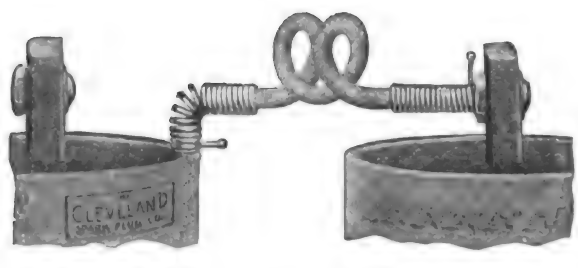
to put cheap plugs on high-priced motors and expect to secure satisfactory results. Equipping a motor with costly anti-friction bearings, etc., to save power and using cheap, inefficient spark plugs, thereby losing more than the amount saved, would be humorous if it were not for the fact that power (gasoline) costs money.

Much of your gas engine ignition trouble can be traced to poor battery contacts, loose thumb nuts, or broken wires. Prevent these by using Cleveland Battery Connectors. They cannot break. Their low resistance joints give hotter sparks and save current, making your batteries last longer. They require no thumb nuts and need not be touched during the life of the batteries. Cleveland Battery Connectors make a perfect circuit, giving you the full power and efficiency of your batteries all times. To apply: Remove battery thumb nut, seize connector between thumb and forefinger and force over threads as illustrated. The coiled bronze wire will clamp firmly with a vise-like grip which nothing can dislodge. You cannot even pull

Quick Detachable Terminals.

them off unless you first expand the bronze coil by twisting the free end to the left.

The Cleveland Quick Detachable Terminal, while especially made for use with the Cleveland Spark Plug, will fit any standard make of plug on the market. It fastens securely to the cable without soldering, requiring no tools other than an ordinary pocket knife for paring the cable-end. It is unaffected by sudden jolts, or vibrations of the motor, and will not slip



Cleveland Battery Connectors.

off under any circumstances. It does away entirely with the annoyance of removing the thumb nut to disconnect the wire when testing the spark, and positively prevents twisting of the mica cores, which is often liable to occur with disastrous results when ordinary thumb nuts are used. To apply: Trim off the cable insulation, pass the copper strands through the opening in the screw and spread the ends. Screw on the outer shell and the terminal is ready for use.

Illustrated herewith will be found the Cleveland Spark Plug with its shooting flame, the Quick Detachable Terminal and the Cleveland Battery Connectors. For further information, address the Cleveland Spark Plug Company, Power avenue, Cleveland, Ohio.

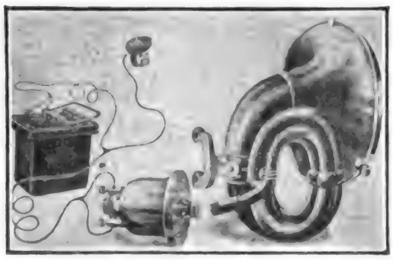
LICENSE PADS AND NUMBERS.

We wish to call the special attention of the trade to the license pads and numbers manufactured by A. P. Stillman, of New York City, as they are exceedingly neat, attractive and convenient. The illustration hardly does justice to the Stillman pad. It should be seen to be appreciated. These pads can be made to order for any State. They are made of enameled fibre, bound with German silver, with raised metal figures on nickel or japan. Pads can be furnished with white or black patent leather finish. Dealers are requested to send for a sample pad, which will convince them of its merits better than anything we can say about it. This pad is already carried in stock by many dealers, and it is an excellent seller. Write for free catalogue to A. P. Stillman, 164 Duane street, New York City, and mention the AUTOMOBILE DEALER AND REPAIRER.

License Pad, Manufactured by A. P. Stillman, 164 Duane Street, New York.

THE GRACK-UNICUM ELECTRIC HORN ATTACHMENT.

The Grack-Unicum Electric Horn Attachment, illustrated herewith, can be screwed on any standard automobile horn. It enables the chauffeur or other occupant of a car to produce a loud, continuous blast of the horn, by merely touching a button. The sound is produced by electricity acting magnetically, the vibrations then being transmitted mechanically to a diaphragm. This diaphragm magnifies the vibrations, and after having been condensed in the metal horn they go out into the air as a loud and penetrating tone.



THE GRACK-UNICUM ELECTRIC HORN ATTACHMENT.
Manufactured by Theo. H. Gary Co., 50 Franklin Street, New York City.

The device is waterproof and dustproof, and so constructed as to be absolutely durable, lasting indefinitely. The contacts are inside, and are of the best iridium-platinum, which is non-corrosive and therefore everlasting. The case has standard thread, and any horn may be screwed on it, after reed and tube are screwed off, making a perfect unit.

The sound is produced by connecting the binding posts with the source of electricity, preferably the sparking battery of the car, the apparatus being worked by a pressure of from four to seven volts. In case no sparking battery is used, four or five dry cells will work admirably. The advantages of this horn over the old pneumatic style are obvious. In order to give warning with the electric horn you need not take your hand from the steering wheel; then, the sound produced is continuous, hence far more effective, and no such troubles can happen as bulb breaking or the reed becoming clogged. This attachment is carried in stock by most dealers. Readers should write for full information to the manufacturers, Theo. H. Gary Co., 50 Franklin Street, New York City. In writing, please mention the AUTOMOBILE DEALER AND REPAIRER.

"A REGULAR GOLD MINE."—This is the heading of the advertisement of the C. A. Shaler Company, Box M, Waupun, Wis., on another page, referring to Shaler's Electric Vulcanizers. They are said to be efficient, cheap, simple, clean, easily regulated and a big money maker for a garage. Write for further particulars, mentioning the AUTOMOBILE DEALER AND REPAIRER.

WANT ADVERTISEMENTS.

Under this head will be printed advertisements of shops for sale or to rent, or shops wanted, or situations or help wanted, or tools or machines (second-hand) wanted or to exchange, at the uniform price of two cents a word, which will include the address, for each insertion, payable in advance. No advertisement will be inserted for less than 30 cents, however small.

Remittances can be made in postage stamps if more convenient. Address,

MOTOR VEHICLE PUBLISHING CO.,
24 MURRAY STREET, NEW YORK.

FINE RAMBLER touring car; in perfect condition; gas lamps, top, tire protectors; must be sold at once, at a sacrifice. Box 68, Cambridge, Maryland.

WANTED — Live Carburettor Agents Wanted—We have considerable unoccupied territory for agents to represent us on the best carburettor yet placed on the market. Good opportunity. Liberal terms. Address at once "Carburettor," P. O. Box 654, New York City.

CORRESPONDENCE with auto manufacturing company with good shop facilities, desiring to take up auto suited to country roads; specially adapted for rural delivery. E. P. Cowles, Warren, Ohio.

FOR SALE—300 sets, 28x3, best grade artillery wheels, fitted with clincher rims, less hubs. Write for bargain prices on single sets or the lot. Address Thos. B. Jeffery & Co., Kenosha, Wis.

AUTO TIRES REPAIRED—Tires repaired by experts and guaranteed; low in price; square deal to all. Lafayette Auto Tire Co., 513 North 9th st., Lafayette, Ind.

FOR SALE—Columbia Electric Automobile Motor, partly wound, perfect condition, $25; new magnetos, four bar, $15; new coils single $5.25, double $9.50, triple $14, four-cylinder $20. Murray E. Main, Delaware, Ohio.

FOR SALE—Two-cylinder five-passenger touring car; looks like new; complete equipment. Lafayette Auto Tire Co., 513 North 9th st., Lafayette, Ind.

BROKEN CASTINGS WELDED. Any wheel. Guaranteed like new. "Futterman Welding System," New York Coach & Auto Lamp Co., 798 10th avenue, New York city.

WILL exchange Missouri land and cash for light touring car. Address G. P. McGraw, Pierson, Iowa.

FOR SALE—Winton 1907 Model M, top and dust cover, TIRE holders, tire case, extra tire, folding glass front, gas tank, two extra seats in tonneau, Kilgore shock absorbers, speedometer; cost new $4,200; will sell for $2,000 and guarantee it in first-class condition. C. C. Stotz, Marion, Ohio.

OVERSTOCKED—Latest goods at 25% off. Four horse power auto engines, $48; three horse power, $30; friction transmissions, $18. Address Climax Electric Works, New Salem, Mass.

HAVE four good residence lots in Ogden, Utah, to exchange for good runabout. Address L. W. Traer, Vinton, Iowa.

FOR SALE—2-cylinder 2-cycle 10 horse power engine; new piston and rings, make and break ignition grease and oil cups; price $50. Central Supply Company, Richland, Pa.

CHAUFFEURS, machinists and repairmen can secure free a set of Bullard wrenches. Write us for special offer. Bullard Automatic Wrench Co., Providence, R. I.

FOR SALE—Steam Automobiles; write for illustrated bargain list. F. W. Ofeldt & Sons, Nyack, N. Y.

CHAUFFEURS, automobile salesmen, mechanics, repair and garage men furnished without charge; only experienced and reliable men, no school students unless wanted; all are guaranteed and bonded by Automobile Sales Corporation, 1661 Broadway, New York.

SOME SNAPS—1908 searchlights and generators, samples used for show purposes only, direct at half price, while they last. Miller Mfg. Co., Peekskill, N. Y., Dept. D.

FOR SALE—ALUMINUM CAN BE SOLDERED successfully by using Aluminum Solder and Flux. Sold by E. F. Lester Co., Fayetteville, N. Y. Write for booklet.

SOLICITORS WANTED.

WE WANT MEN in all parts of the country to solicit subscriptions for the AUTOMOBILE DEALER AND REPAIRER, and are prepared to offer extremely liberal terms. For particulars address the Motor Vehicle Publishing Co., 24 Murray street, New York.

TIRES RECOVERED, 12.00 up, according to size. Non-skid, leather, rivet shod tread, $15.00 up. All kinds repairs done promptly and reasonably. Very best material and workmanship. All recovers guaranteed 2,000 miles. Good second-hand tires $10.00. New York Steam Rubber Tire Repair Works, 306 West 52d st., New York City.

FORD RUNABOUT OWNERS—Modernize your car with Rumble seat and trunk, $15. Glass front, $12; 3-hinged folding hood, $8; roadster fenders with brass bound running board, $12. Discount to dealers. State your wants for catalogue. Auto Rebuilding Co., Chicago, Ill.

MODEL A CADILLAC—Removable tonneau, with deck, new tires, lamps, generator, etc.; car in perfect running order; make me offer; write at once. Jos. T. Levanduski, P. O. Box 45, Rockfall, Conn.

AUTO TIRES—We repair any tire that can be repaired. Prices reasonable. La Fayette Auto and Tire Co., 513 North 9th st., Lafayette, Ind.

FOR SALE—Valuable Patents, covering Automobile Transmission Mechanism. Inquire of Ft. Wayne Gear Co., Ft. Wayne, Ind.

FOR SALE—Beautiful new 50 horse power, seven-passenger Pope-Toledo Model "U" 15 touring car, finished in coral red. Patent leather upholstering, beautiful cape top, 10-in. Rushmore headlights. Will take for part pay any good standard runabout. Robert Holmes & Bros., Danville, Ill.

FOR SALE—Renew Old Dry Batteries; tested recipes for renewing sent for 25c. Roy Graham, Stockton, Kansas.

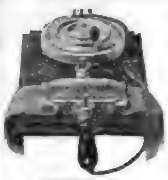
REBUILD YOUR CAR into "Gentleman's Roadster." We make latest style hoods, radiators, tanks, fenders, "hood dashes," glass fronts, auto trunks, Rumble seats, etc.; 20% saved. Your old car re-designed free. Hood and Dash outfits for '03 and '04 Ford, Cadillac and Winton in stock. Smashed lamps and radiators repaired like new. State your needs for catalogue. Auto Rebuilding Co., Chicago, Ill.

THE WONDERFUL AUTO LUBRICANT.—In this issue will be found the announcement of the Perfection Grease Company, South Bend, Ind., manufacturers of the Triumph Grease. This is said to be that "Red Grease" that they are all talking about. They want to send a generous free sample to every reader of the AUTOMOBILE DEALER AND REPAIRER, in order that he may get acquainted with their lubricant. Write for it now, mentioning the AUTOMOBILE DEALER AND REPAIRER.

LACOSTE COMMUTATORS.

We wish to call special attention to the announcement on our outside back cover this month, in which the famous Lacoste Commutators are offered at extraordinarily low prices. But consult the advertisement and send your orders to the Lovell-McConnell Manufacturing Company, Currier Building, Newark, N. J. In writing them, mention the AUTOMOBILE DEALER AND REPAIRER.

SHALER ELECTRIC VULCANIZERS



TYPE B
For Tubes and Casings

"A Regular Gold Mine"

So says Wichita Automobile Company

WHY?

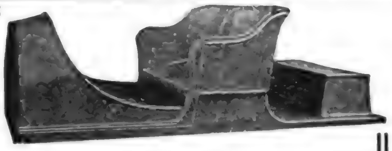
TYPE C
For Casings

Because they are efficient—cheap—simple—clean—easily regulated, and

A BIG MONEY MAKER FOR A GARAGE

Write C. A. SHALER CO., Box M, Waupun, Wis., U. S. A.

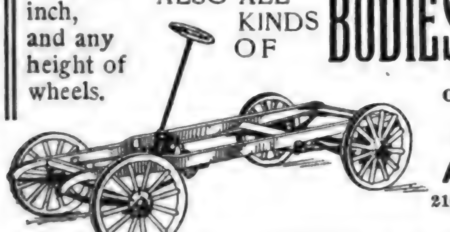
AUTOMOBILE



Running Gears, with pressed steel or angle iron frames, also chain or shaft drive. Any wheel base up to 120 inch, and any height of wheels.

ALSO ALL KINDS OF **BODIES**

Wheels, Axles, Steering Devices, Springs, Etc.



WRITE FOR OUR NEW CATALOG AT ONCE.

BORBEIN AUTO CO.,
2109 & 2111 N. 9th ST., ST. LOUIS, MO.

TRIUMPH GREASE

THE WONDERFUL AUTO LUBRICANT

This is that "Red Grease" they are all talking about.
GENEROUS FREE SAMPLE
If you mention this journal. Write NOW for particulars.

PERFECTION GREASE CO.,
SOUTH BEND, IND.

EXCELSIOR SUPPLY CO., Chicago, Ill.
Western Agents.
JAMES L. GIBNEY & BRO., Philadelphia, Pa.,
Middle States.
R. E. P. SPORTING GOODS CO., Brooklyn, N.Y.
Agents for N. Y., N. J. & Middle States.
THE POST & LESTER CO., Hartford & Boston,
New England Agents.

"Motors That Mote."

To Keep the Motor Motoring Use

Dixon's Motor Graphite

It makes better compression in cylinders, prevents cutting of bearings, lessens gear wear and noise. Write for free "proof" sample.

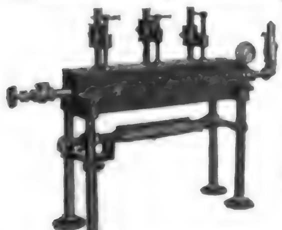
JOSEPH DIXON CRUCIBLE CO.,
JERSEY CITY, N. J.

A Sticking Success

Can use it on the road or at home.

Try C. O. T. Gum Gum to fill up the digouts in the rubber of your outer casing.
Four Ounce Tube Fifty Cents.

CHAS. O. TINGLEY & CO.,
Rahway, N. J.
Established 1896.



The "Boilerless" Steam Vulcanizer

NEWEST RELATIVE OF THE "EXCELSIOR."

Underneath the square semi-steel body is fitted our special gas burner, thus doing entirely away with boiler for inner tube work.

Furnished complete with steam gauge, safety valve, filling valve, air cock, and our well-known quick-acting clamps. LOW COST. HIGH SATISFACTION. Immediate Shipment.

WISHART - BURGE MACHINE WORKS,
64-66 SOUTH CANAL STREET, CHICAGO, ILL.

F. W. Ofeldt & Sons,
Nyack-on-Hudson, N. Y.
Manufacturers of
Blue Flame Kerosene Burner,
Safety Water Tube Boiler,
Automatic Water Regulator,
Automatic Fuel Regulator,
Feed Water Heater,
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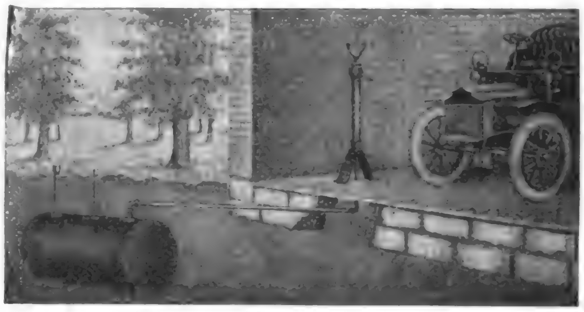

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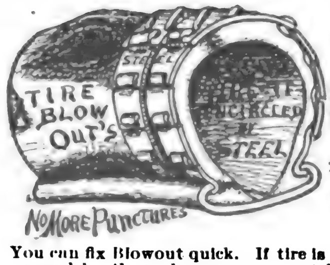

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VOL. V., NO. 5. NEW YORK, JULY, 1908. PRICE { 10c. PER COPY / $1.00 PER YEAR

RUNABOUT BODIES.

How to Make and Fit Them to Almost Any Chassis.

Many who own a limousine, a landaulet, a traveling or a touring car, wish for a good style of racing or runabout body for it which can be easily fitted on and dismounted. When the chassis is built exclusively for one of these light, neat bodies, the width is from 30 to 32 inches, which is the proper width. The length, of course, is made to suit the racing body which has very low sides but a great deal of leg room, besides ah extension rear seat which gives the auto racing car such a length, and consequently can be fitted almost on any machine without any trouble.

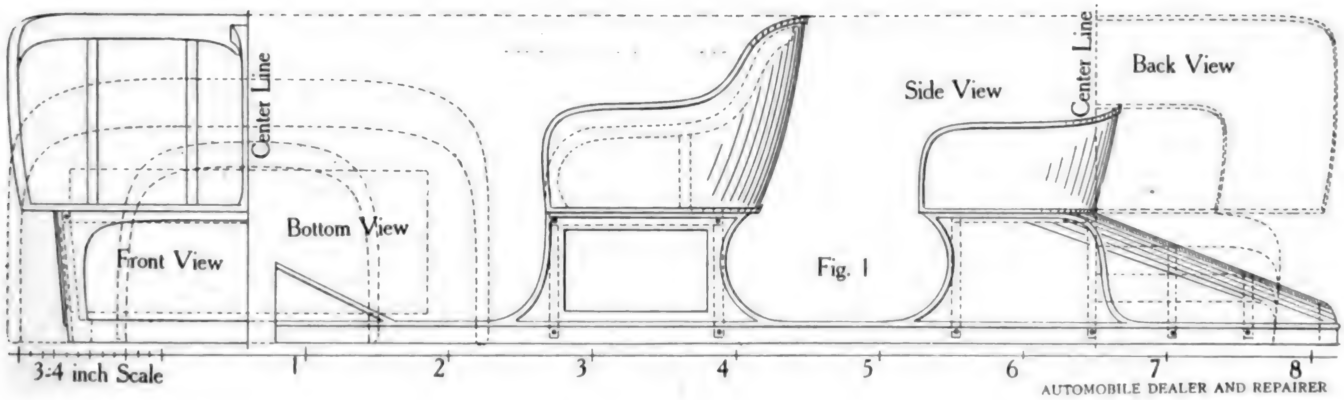


Fig. 1

If built on a machine which answers the length for a landaulet, limousine or touring car, the width of the chassis is generally 33½ or 35½ inches, which is 2 to 5 inches wider than the frame especially built for a runabout, therefore the widths of the bodies, including the lengths, must always be kept in mind and the body must be designed and built to suit the frame. In the six styles we illustrate, the length of bodies and seats is designed to fit frames from 30 to 32 inches wide, and such bodies are of the lightest possible construction. A great many of these bodies have been built and a great many more will be wanted, and the various ideas which these bodies contain will help the auto repairer considerably when the orders have been received for such bodies.

Fig. 1 is one of the lightest and most peculiar bodies made, and looks exceedingly well and is as light as a shell. The body is all wood and well canvased on the inside, and the panels are less than ¼ inch thick. Note the shape of the rear body panels drawn in dotted lines on the back view. If this shape is too difficult to bend, flatten it to suit the panels on hand. Note also the strainers; they are very light, ¾ inch square is the size, and they should be bent, but can be spliced if the auto repairer has not the facilities to do so. The three strainers are square up and down, but it is decidedly less work if they are dressed square and framed into the bottom sides square with the top panel. The rear end bar is made deep enough to obtain the curve of the body.

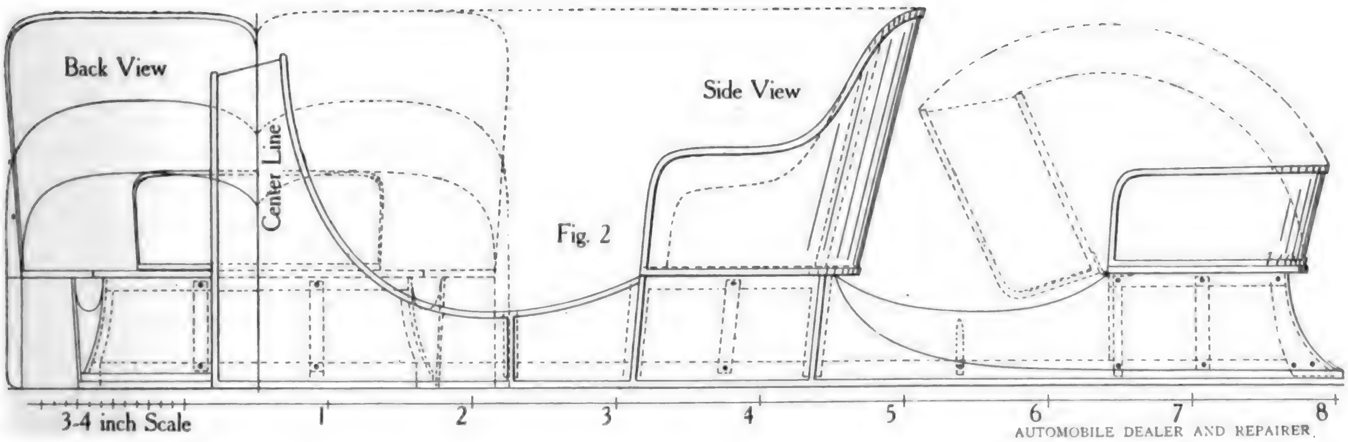
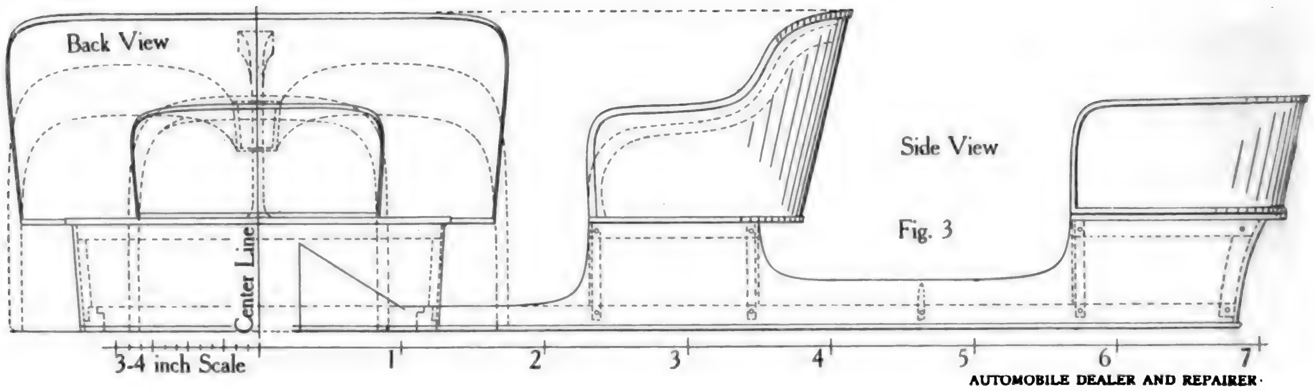


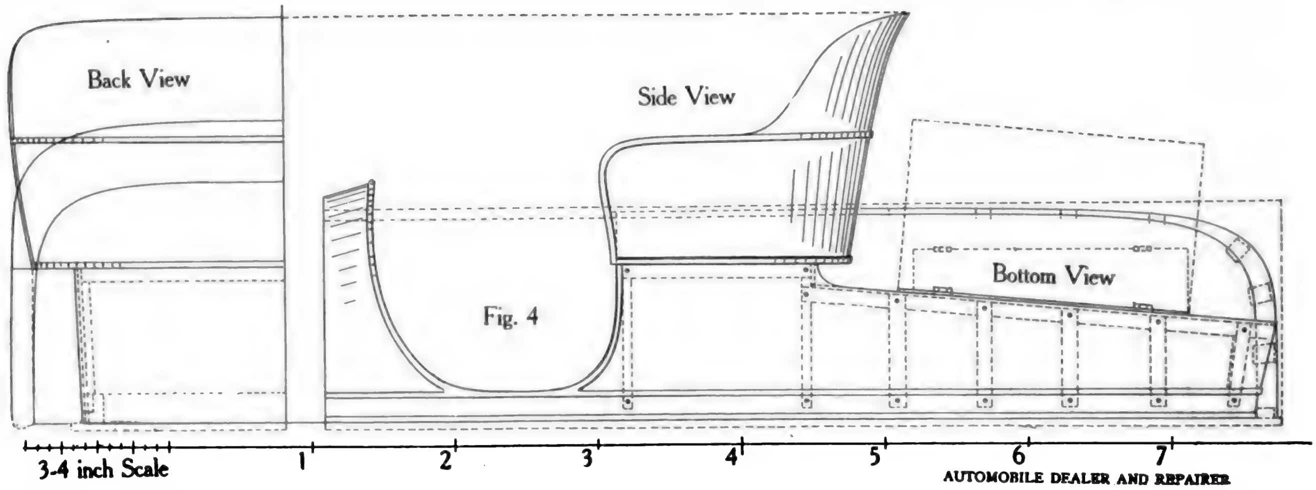
Fig. 2

The front view of the body to the left is inclined and the same inclination is on the front of the rear seat. The shape of the seats is shown on the front and back views. The rear seat is framed and paneled and the front seat is covered with aluminum. If the front seat is desired of wood panels also, take out the up and down curve and make it nearly straight, as it is difficult to bend two curves on these seat panels and they may split in bending. The

curves across the seat top and bottom are drawn into the front view and the dotted lines indicate that the front seat has no division in the center, as most of the seats have. The top and bottom curve of the rear seat is also shown on the front view.

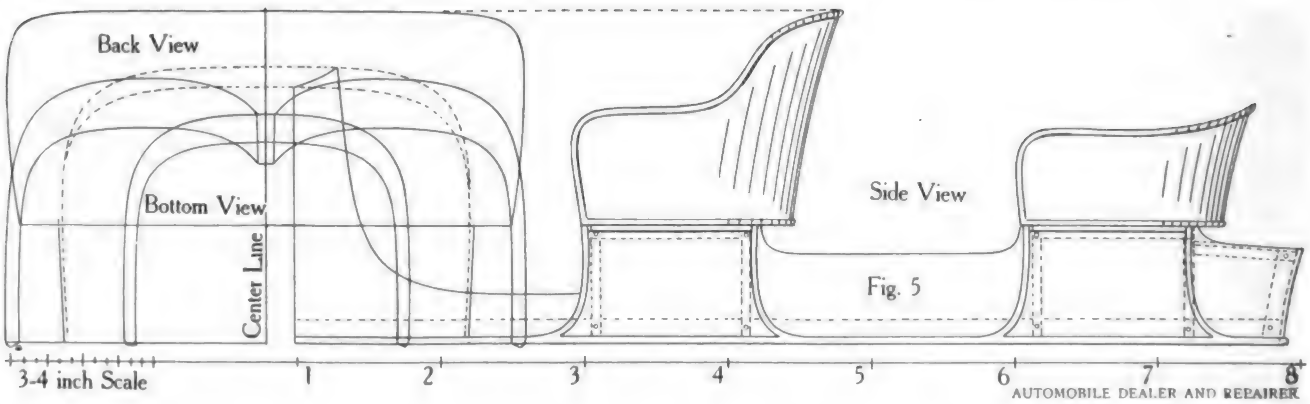


The width across the body at the bottom is 30 inches without the mouldings and 32½ inches on top with the mouldings. The widths across the front seat are, bottom 38 inches, and across the top 40 inches. The widths



of the rear seat are, bottom 20 inches, and across the top 22 inches.

Fig. 2 is an entirely different style; the front part is a metal hood with a rim worked on all the three edges and



is secured to the sills. The front part of the body directly under the front seats is framed and slightly inclined. The two front panels, one on each side, run to the rear end, but are cut down to ¾ inch above the lower edge sill mouldings. Starting from the rear end of the front seat, the panels concave and narrow up toward the rear narrow seat, which can be best seen on the back view, where the side flare under seat is seen also, the concave panel under the rear seat. This construction looks exceedingly well. The rear seat is hinged to the body and turns forward, as shown by dotted lines. The front seat is a twin seat and is 22 inches high. The dotted line on the side panels indicates the shape of the division in the center. The shape of the front seats, also the small rear seat, is shown in heavy and dotted lines. The size of the sills on such bodies is generally 2 inches thick on bottom surface, including mouldings and panels.

The width of the body across the bottom is 30 inches and across the top 31 inches. The width across the rear and top of the body is 25¾ inches. The width of the front seat across the bottom is 39½ inches, and across the top 42 inches. The width across the bottom of the rear seat is 20¼ inches, and across the top 21 inches. The side panels on Fig. 3 are 9 inches deep, the same as on Fig. 2. The side surfaces of this body are plain except a light moulding on the bottom edge. The spaces between the dash and front seat, also leg room for the rear seat, are long. The body is framed very light, as shown by dotted lines, and the thickness of the side panels is ¼

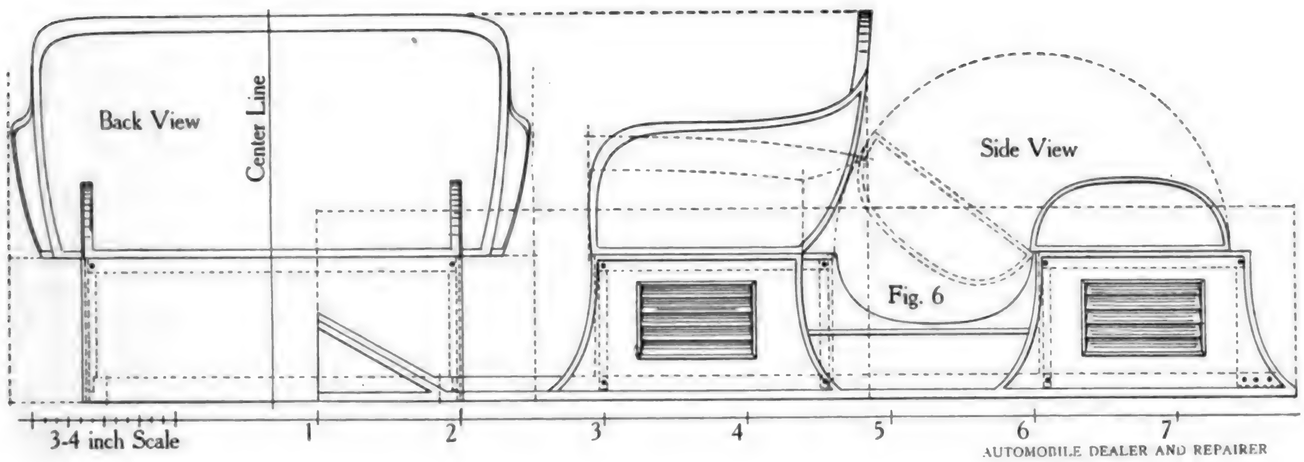
inch scant. There is a twin seat in front, and note the shape in center. The dotted lines on the front seat indicate the division at the center of the two seats. Both seats are paneled with grain up and down. Note the shape of both seats on the back view. The width across the bottom of body is 30 inches, and across the top 31½ inches. Width across the bottom of front seat is 40 inches, and across the top 42 inches. Width across the bottom of the rear seat is 20½ inches, and across the top 21½ inches.

Fig. 4 differs entirely from those explained. There is a small metal hood in front, and but one seat not divided in the center. The seat is made of two parts, upper and lower, and joint covered with moulding. The rear part of the body is long, the top line receding toward the rear, and the rear end is rounded, as shown on the bottom view. The top has two doors or lids and they are hinged to either side. On the side view the hinges are shown in heavy lines, and on the bottom view the hinges are shown in dotted lines, including the door raised to show the width of each. The framing of the body is shown in dotted lines, standards, rails and strainers.

Fig. 5 represents a very light racing body with 10 inches deep panels and all mouldings are curved, making a very pretty finish. The shape of the metal hood is shown on back view in dotted lines, a twin seat in front, and note the curves across the front and rear seat. The rear part of the body on top is closed and the entrance is from the front under the seat. The widths of body and seats are similar to Fig. 4.

Fig. 6 represents a runabout body with a phaeton seat and rear turn over. The front seat is stationary; the rear seat is hinged across bar, when open it rests on rear of body and when closed fits over the side panels, and joints are covered with iron mouldings, closing the space between the seats. Those runabouts with turn seats are very popular and also handy to carry a considerable amount of packages.

The width across body top and bottom is 32 inches back and front, and outside of rear seat is the same width. The widths of front seat are as follows: Across bottom front and back 38½ inches and 36¾ inches. On top front and back 43⅝ inches and 40 inches. The construction of the body is similar to the others, and the seat has board sides; corner posts lapped to it and rear paneled over with a ¼ inch thick panel, same as a carriage seat.



In a modern water-cooled gasoline motor only 17 per cent. of the heat is utilized for useful work, the rest being radiated or lost through the exhaust.

A Buyers' League.

The International Automobile League has been incorporated in Buffalo with a capital stock of $50,000, the principal purpose of the league, according to its announcement, being to reduce the cost of owning and maintaining an automobile. Apparently it is the purpose of the league to address itself particularly to individual automobile owners throughout the country.

A preliminary pamphlet makes the statement, in substance, that the league aims to reduce the cost of tires and accessories, of gasoline and other demands of the automobile to all who join its ranks. The plan of the league in this respect is to have its members buy their tires, supplies, etc., from establishments in the various cities and towns that have made special prices to the league, the prices to be given to all league members upon presentation of the membership card of the league, or by the exhibition of the league's tag, which is to be attached to the automobile of every member of the organization.

It plans to have a system of tire and supply houses, gasoline stations, garages and hotels in every city and town where it is possible—a chain of them from coast to coast, as it were—and where the members will be able to get the special reduced prices to league members upon presentation of their membership card or tag.

A sentence in the pamphlet which is giving prominence is this: "Members of the league are not restricted to the purchase of any particular makes of tires or to any special brand of accessories. The league is concerned only in reducing the cost of owning and maintaining automobiles to individual owners." The headquarters of the league are at 330-332-334 Washington street, Buffalo, N. Y.

Physicians Favor Cars.

In discussing the advantage of physicians using automobiles, Dr. A. H. Robinson, of Kenosha, Wis., says: "Two years experience with an automobile in my practice after eighteen years experience with a horse, has convinced me that I can do double the amount of work with an automobile and yet have more time for recreation. After eighteen years of faithful service I do not wish my old horse to fall into unkind hands, but if he were to die I never would buy another but would use two automobiles. I have never had an accident with my car and have never been towed in and the car has always gone on its own power, although the first thing I did with it was to make a 2,000 mile trip. I expect it to run as well for two seasons more."

If you don't see what you want, ask for it.

THE GARAGE

A CONCRETE GARAGE.

How to Make the Blocks, and Full Details of Construction.

BY JAMES F. HOBART.

A wooden garage may be regarded as a mass of kindling ready for a spark to turn it into a blaze which may destroy the car and threaten or even destroy the dwellings or other buildings adjacent to the garage. A garage built of steel, with sheet steel covering, sides and shingles is a very pretty proposition to talk about, but in practice it doesn't show up nearly as well. It is almost impossible to erect such a structure which will be tight enough to prevent the wind from blowing through it. The steel frame, sheet steel covered garage is a very hot place in summer and a mighty cold one in winter. It is almost impossible to keep the interior of such a building at an even temperature, and, worst of all, the building will "sweat" whenever temperature and dew-point come right, and that is all too often.

The brick garage has one thing which kills it in many cases, and that is the cost. Stone makes an elegant appearing structure, but the cost of cut stone is even more costly than brick. There remains, for the man who wishes an elegant appearing garage at a moderate cost, one other building material—concrete. This substance may be made of any required strength and solidity, up to being capable of withstanding a load of 8,000 pounds to the square inch, or 576 tons to the square foot. But such strength is unnecessary. It is also expensive for the reason that to possess such extreme strength the structure must needs be built of almost pure cement, instead of concrete which contains only a small percentage of cement, say from 8 to 25 per cent., the remainder of the material consisting of sand and gravel or broken stone.

For a garage, it is important that the roof be waterproof, and that the walls will not absorb water enough to keep the interior of the building damp. There are several methods now in use for constructing concrete buildings. They may be laid up of concrete brick, built of concrete blocks, poured from liquid concrete into a water-tight mold, or they may be built up by plastering concrete mortar and blocks around a steel frame.

The concrete block offers the most promising material for the garage maker, for if he chooses he can make the blocks himself, at his leisure, and erect the building when he pleases. But the concrete block has been given a hard name, and many architects and many builders are afraid of blocks and will have nothing whatever to do with them. But this is not the fault of the block; it is the fault of the man who made the blocks. The reason is a general lack of knowledge as to the making of concrete blocks of great strength and low water absorption capacity.

Later it will be told how to make blocks weighing 170 pounds to the cubic foot, withstanding a crushing load of 2,500 pounds to the square inch, and absorbing less than 6 per cent. of water by weight. It will be shown how the would-be garage constructor can make blocks of this strength with only 10 per cent. of cement. The secret—if there be any secret about it—is the use of a very coarse gravel for the body of the concrete. Tradition has told us that to make a good concrete for building foundations we should use one part of cement with three parts of sand and five parts of broken stone. Tradition further instructs that to make extra strong foundations for machinery, we should use cement, sand and stone in the proportion of 1, 2 and 3 parts respectively. For a long time concrete has been made up according to this "hand-me-down" rule, but nothing could be further from correct practice.

Neither 1, 3, 5 or 1, 2, 3 will make a concrete as strong or as impervious to water as can be made with more coarse rock or gravel and less sand. If gravel be taken from the bank, and concrete mixed from that material, with no attempt to arrange the proportions of coarse and fine material, it is ten to one that a weak, porous concrete is the result. That is just what ails the concrete block as it is made to-day by thousands of people all over the country. They take the gravel as it comes, and they get the blocks as they come, too.

Let the material be screened into two or three grades. All that portion which will be caught on a screen having four meshes to the square inch, and passing through a screen with openings one inch square—let that grade form the coarse material, or aggregate, as it is often called by concrete makers. For the fine material—the sand—screen out that portion which will be caught between screens of 400 and 256 meshes to the square inch. These screens will have respectively 20 and 16 meshes to the linear inch, and are technically known as No. 20 and No. 16 screens. The screens for the coarse material are known as No. 1 and No. 2.

To make the strongest possible concrete, and the one which will take up the least water, using the above-described material, take one part of good Portland cement, one part of the No. 16 sand and four parts of the No. 2 gravel. This mixture, wetted with about 10 per cent. of water and rammed until water shows itself on top, will only absorb a little more than 5 per cent. of water, and will stand over 3,000 pounds pressure to the square inch after having been made twenty-eight days and kept moist during that length of time. This concrete contains about 16 per cent. of cement by weight. By cutting down the cement to 10 per cent. the absorption will be increased a little, say to 6 per cent., and the strength will come down to about 2,500 pounds to the square inch. As this is more strength than ever will be needed, it is certainly strong enough for any structure, to say nothing about its fitness for the 10 to 20-foot walls of a little garage.

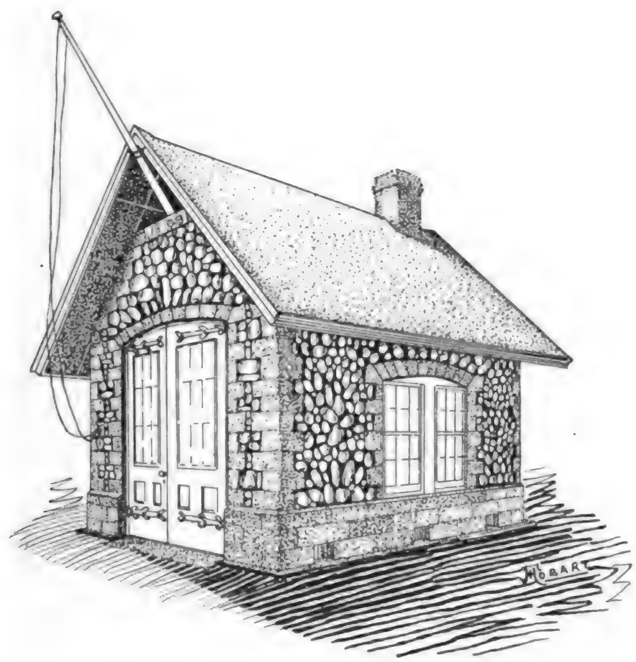
Had the gravel been taken as it came from the pit, and roughly separated in the proportion of 1, 3 and 5, the strength would drop to about 800 to 1,000 pounds to the square inch, and the water absorption would go up to 10 to 15 per cent. There are other combinations of coarse and fine material which will give excellent results in concrete, and many combinations could be named which would give a concrete with a much smoother surface than the 1, 1, 4 mixture described above, which is certainly a very coarse appearing concrete—coarse but strong, and almost waterproof.

In the construction of a garage, the effect should be pleasing, artistic, and in harmony with whatever other buildings may adjoin the site of the proposed building. The severe appearance of concrete buildings as now con-

structed is on account of their being built or made up to imitate some other form of building material. For instance, blocks are made to imitate rock-face work. The entire side of a building will be made of imitations of one or two, or at the most, three forms of rock-faces. Or these rock-faced blocks will be used in connection with plain blocks, as like as so many peas each, made to imitate a dressed and finished block of stone.

Again, the smaller portions of the exterior surface of the building will be formed of concrete shapes made in imitation of bricks. And so it goes. Imitations all along the line, and after the building is finished, people wonder why it doesn't look like something worth while. The reason is, that it cannot have an individuality of its own, for the reason that it is all imitation from top to bottom.

There is a way by which a concrete building can be made to look like something worth having—to have an individuality and a beauty of its own, and still be in harmony with whatever surroundings may be adjacent. The way to do this is to let the concrete have an individuality



CONCRETE GARAGE FOR A SINGLE CAR.

of its own and to represent concrete and nothing but concrete, instead of imitating stone or brick. If the exterior surface of the wall be composed of ½-inch particles, partly filled between with sand, and cemented firmly together, do not try to cover that surface with finer material in order to make it look like hammered or broken stone.

If the surroundings call for a display of rock-faced work, do not try to imitate rock facing by casting the concrete in molds, either metal or sand, but actually rock-face such of the blocks as require that treatment. Rock-facing concrete blocks is a very easy and simple operation which does not require skilled labor. Stout boys and intelligent laborers can be taught to rock-face blocks at a very slight cost.

The accompanying engraving shows a building suitable for small garages and the distinctive features of concrete are retained and no attempt is made to imitate anything except concrete—and good coarse concrete, too, concrete which is everlasting and which will not soak water like a sponge. Details of this building, and the method of constructing it, and of making the concrete blocks of which it is mainly composed, will be given in a future issue of this journal.

It will be noted that the walls are constructed with concrete block trimmings upon a window-stool level of solid blocks surmounted by a bevelled water table upon which the window frames are placed. That portion of the walls between the corners and the door and window trim is shown filled with cobblestones gathered from field or hillside. This detail is to be varied to harmonize with the surroundings. The space now filled with cobbles may be laid up with brick, making a very pleasing combination effect. If desired in straight concrete, the blocks to fill the cobble space may be rock-faced by hand, according to directions to be given later. Or, the trimmings may be rock-faced and the cobble space laid up with plain blocks. This arrangement is not desirable as a general thing, the usual custom being to finish the trim and let the body go rough or rock-face.

The roof may be varied as desired. The one shown in the engraving is half pitch. That is, the vertical distance from top of side wall to peak or ridge of the roof is one-half the width of the building. The roof shown is made of concrete with a steel frame as indicated on the underside of the left slope. There are innumerable methods of putting on a roof, as a plain wooden roof may be used if desired, and there is very little outside fire risk when such a roof is covered with slate or tin.

A cement roof may be made without the cross-framing shown under the slope. This may be done by setting the rafters, building a mold underneath them, then placing concrete to cover the mold or form, especially in the corners next to the rafters in such a manner that wire cloth or wire netting laid over the rafters will hang down between the rafters to the curve of the placed concrete. The wire netting forms a reinforcement which strengthens the roof to the necessary degree of rigidity. If desired, the roof may be rodded between the steel rafters, and the spaces between beams filled with thin concrete blocks, laid in cement and painted with asphalt or any other suitable roof paint.

The size of the building shown is 14x18 feet, with walls 10 feet high. The door is 8 feet wide by 9 feet high to the spring of the arch, thus permitting the largest car to enter or leave with hood up, and a world-circling stack of tires on top of the hood.

A free circulation of air is provided at all times by means of the grated openings, three of which are shown along the side of the building. There are three more similar openings on the opposite site. These openings are 8 inches high (the thickness of a single block) and 12 inches long. The grating rods are drilled directly into the blocks above and below. These openings are fitted with controlling shutters on the inside of the building.

An opening in the gable will be noted, through which the flagstaff projects. A similar opening in the other gable permits the egress of undesirable vapor, and like the wall openings, these gable openings are fitted with controlling shutters. The flagstaff, of course, is ad libitum. It is to be added when needed to balance the chimney and to fill in with the surroundings of the building. The staff may be placed as shown, or a bit of large steam pipe may be built into the roof and the flagstaff stepped therein like the mast of a sail boat, to be removed during the winter months.

The chimney is a mighty good thing to have and is a necessity in most latitudes, during at least a portion of the year. It is built directly on top of the end wall, and occupies a portion of the gable opening in that wall, leaving a triangular opening on either side of the chimney. By placing the chimney on top of the end wall, it is out of the way during warm weather when it is not needed, the stove being connected by removable pipe, which is taken down during the heated season.

The location on top of the wall is also desirable for the chimney when the stove is to be excluded from the garage, something which should always be done when safety from gasoline fire and from explosion is to be safeguarded against as much as possible. When the stove is to be excluded, place the chimney on the wall as before, then build a little "lean-to" addition to the garage, on the rear end of the building. Put a little boiler in the lean-to, run heating pipes through the wall and around the garage as necessary and there will never be the least danger from the heating fire, particularly if there be no door or other opening through the rear end of the garage, access to the fire-room being had only by going outside of the building.

A high pressure boiler may be used instead of a little heater, then a lathe can be run, or you can operate a generator for charging storage batteries. The garage is large enough to accommodate several machine tools and still leave room for the car. It will be noted that the windows have been "bunched" at a point opposite the car, and with similar windows on the opposite side of the building, and two large sashes in the outwardly swinging doors, there will be no lack of light in any part of the building.

The details of this structure, the method of making the blocks and the manner of curing and placing them will be described in the next issue. If possible, some form of block machine is desirable. Almost any machine can be used, and a machine can probably be hired for the occasion. Failing this, the necessary blocks can be made in wooden forms or molds which are to be homemade from pieces of plank or boards.

A very pleasing effect may be secured by making the trim blocks as shown, and filling with pieces of slag from an iron furnace. This execution is very desirable with some surroundings.

(Concluded next month.)

Tire Inflation.

If the tire is not pumped hard enough the lateral stress will have a tendency to drag it off the rim, and if the fitting between the rim and tire is close enough to avoid this, the lateral rolling motion will in all probability tear the sides of the cover away from the beaded edges; hence the greater the weight carried by each wheel the higher must be the inflated pressure. It should not be forgotten that a tire may appear to be sufficiently inflated during a period of rest, but when the car is travelling, the wheels passing over uneven surfaces, they have to surmount stones and other obstacles; also to drop into holes, causing the wheels to bump, which has the same effect as if a blow had been struck, and for the time being considerably increasing the outside pressure upon the tires. Therefore it is necessary that tires should be so inflated that the compression provides against such contingencies. Tires are oftentimes run by users half inflated, and there is nothing more destructive to the life of a tire and the durability of a car.

Of course no hard and fast rule can be given for inflation, but for a small car 60 pounds pressure may be enough, while heavy 6-inch tires require much more. Striking an average, 80 pounds for the back tire and 70 pounds for the front will be found about right. The rule of thumb for blowing up tires is a great error, and, looking to their value, it is wonderful the risks users run. It is so easy to over-inflate, or the reverse, in these circumstances. Money is well invested by the purchase of a pressure gauge, by which the owner of a car can at a glance see the pressure. Many car drivers flatter themselves that they can tell the right pressure by the appearance of the tire when the weight of a car is upon it, but let them test such an opinion by the use of a pressure gauge test, and it will usually be found that they were greatly out in their calculations. If a gauge is not available, the tire may be pumped up in the ordinary way, and then to test if it is sufficiently inflated let it take the car weight. Rock the wheels in a lateral direction, when no side roll should take place, and at the "ground contact" there should be no bulge.

As an instance of the special care required in cold weather, the writer on one occasion last winter mounted a car without particularly noting the tires. All went well on a good road for some two miles, when an uneven road surface caused the off hind wheel to bump. On reaching the destination, close at hand, and on pumping up the tire, using a pressure gauge, it revealed 40 lbs. only. Being a high-grade tire, the sides stood up well, assisted by the low temperature.

Size of Tires.

The matter of American and metric sizes in tires is often puzzling to owners who do not have conversion tables handy for translating the inch and metric sizes into each other. There are also many tire users who are doubtful as to the proper method of inflation to get the best service and to meet the double question of corresponding inch and metric sizes and the proper tire pressure.

The following table gives the inch and metric sizes which correspond, next the proper pressure to which they should be inflated, and lastly the number of pounds weight which each tire is expected to carry, including passengers:

3"		65 lbs.	600 lbs.
3½"	90 mm.	70 lbs.	700 lbs.
4"	100 mm.	80 lbs.	900 lbs.
	105 mm.	85 lbs.	950 lbs.
4½"	120 mm.	90 lbs.	1200 lbs.
5"	125 mm.	90 lbs.	1250 lbs.
5½"	135 mm.	100 lbs.	1500 lbs.

In order to take advantage of the information conveyed by the table it is necessary that the person in charge of inflating the tires should have an accurate pressure register. One of the handiest and most popular of these devices is the National pressure register, which gives a direct reading in pounds pressure, and makes possible the absolute correct inflation of all tires.

The Noise of Gears.

When gears run absolutely right they do not make much noise. If they grind, or rattle, or buzz, it is safe to say something is wrong—just what, it is not always safe to say even after a thorough examination. They may run out of true, or fail to mesh properly, or become worn, or lack lubrication. For deadening noise from gears in enclosed casings, some one makes the suggestion that they be lubricated with minute cork filings mixed with a rather heavy cylinder oil in about the proportion of three parts oil to one of cork. The writer adds, however, that it should never be used where there are either ball or roller bearings, or where lubrication of the bearings is dependent upon splash of lubricant from the gears. The mixture may be injected by means of any convenient grease gun, or if the transmission is provided with a suitable sized filler cap it will flow through a funnel, as it has about the consistency of heavy steam engine cylinder oil.

It may be remarked that lubrication of this kind is likely to slightly retard the free running of the gears, but there is no doubt of its efficiency in deadening the sound. Quite likely also the cork filings should be renewed quite frequently.

A car purchased in 1903 by Dr. L. S. Eastlake, of Chicago, gave him good service in his practice for over 107,000 miles before he sold it recently.

POINTS FOR DEALERS.

A Few Reminders Concerning the Advantages of Automobiles Over Horses.

The car that sells best to-day in most localities is the rather low-priced one, costing from $500 to $1,500. The well-to-do farmer wants one of this sort, so does the butcher, "the grocer, the candlestick maker," the foreman at the factory and the average professional man, always including the doctor.

Nothing that a farmer or business man can use possesses more good things that a dealer can drum into the minds of a prospective customer than a low priced motor car. There is the saving in time, in money and labor that will cause any one who has good reasoning faculties to desire to possess a car when once the features are pointed out. But like everything else of modern invention, the possible buyers want to be shown.

It takes more than a word to convince a farmer, doctor or professional man that an automobile is worth more to him than a horse and carriage. Some men will not see the point at once and others are shrewd enough to grasp it at the beginning. A dealer who would sell autos must possess more than a simple car. He should have facts and figures before him. He must be able to prove the value of his line. These will enable the hard working intelligent dealer to build up a trade that he would hardly believe is possible.

Motor vehicles will each year fit into work of greater variety. It does not take a visionist to see the great possibilities that lie before the automobile in the country.

Practical people who have much driving to do are buying motor cars. As their value becomes wider known and the savings understood, more will be sold to other practical people. Gasoline is cheaper than oats when compared on a mileage basis. It is as safe and sure as horse flesh, and always ready when wanted.

An auto costs less to maintain than a horse. Those who have used both side by side have determined the truth of that assertion. The horse consumes feed whether it is used or not. The auto has to be provided with feed—or fuel—only as often as it is used. If the car lies idle for a week there is no expense for feed or care. No one has to exercise it to keep it in condition.

A low priced automobile, if a good and reliable make, will run from 20 to 25 miles on a gallon of gasoline costing from 15 to 25 cents. The cost of lubrication is not heavy. Such a car can be driven at any speed desired from 4 to 25 miles per hour.

In making long hurried trips the automobile will prove its superiority over horse flesh in speed, safety and surety of getting there. An automobile will not tire. It can travel 100 miles a day and more than that, without injury, no matter what the weather. In winter a good auto will travel over any road that a horse can pass upon. A child or woman can drive it, and there is no shying at cars or becoming frightened at anything, as is the case with animals of mettle, such as many prefer to possesss.

The cost of horse and automobile when both are in constant use is not far divergent. The investment in a good team or good auto is practically the same. The cost of two good horses and a nice carriage will not be far from $650. A splendid motor car, well built, that will get over the road and be a source of pleasure, will cost the same. It will cost no more for gasoline to travel 25 or 50 miles than for feed for the team. An auto will stand where it is placed for an hour or a day, without any cost whatsoever. If a team is put up and fed at the stopping place there is an expense.

Horses must be shod as often as the shoes wear out. This will offset the cost of repairs on an automobile, if it is well constructed by a builder who knows his business. Each day and often twice a day a team has to be rubbed down and curried. An automobile has to be cleaned only after it is used. When it is idle all care ceases. The bill of the veterinary surgeon is liable to be as great in the course of a year as the repair man's, and the charge of the painter will be about the same on carriage or automobile.

Pleasure is a feature of farm life that is more often considered now than formerly. It is true pleasure to any one to sit behind a spanking team and be whirled over the roads in fast time. But unfortunately farmers do not always feel that they can afford a team for use for nothing but driving, and work teams are not usually good drivers.

What, then, could make the farmer happier than to be able to jump into an automobile at his own inclination, drive as fast or as slow, and go far or near, as he pleases? He does not always feel that he should take his tired horses from their stalls or yard after a hard day's work to satisfy his own wishes, but his auto is always ready and never tired.

The exhilaration of driving a motor car is fully as great as to ride behind a span of trotters. It is different, to be sure, but once felt will create a desire to repeat. On Sunday, when the family desire to go to church, the automobile is ready to take them. The team that has worked hard all the week can enjoy a day of rest that has been deserved, and it will feel all the better for it.

There are many good motor cars, and there are others that have not met with the success the makers had hoped for them. It is to choose the best and avoid the poorest machines that should give the dealer the most concern. A cheap, poorly constructed and unsatisfactory line will do a great deal to injure the prospective field of any dealer. A well made and dependable machine will do as much to build up his trade. He should not consider an auto at too cheap a price. Nor is it necessary to buy one where fancy finish, trimmings and extras add much to its cost.

To-day a great many autos are sold by manufacturers and by mail, for the simple reason that it is not always easy to find agents willing to take the chances and order a sample machine. They dread to go to the bother of learning the mechanism of a car, and to successfully operate it. But once a man has taken an agency and has advanced himself to the point that he can drive his auto in and out, through and around his territory, he becomes an enthusiast and makes one of the best salesmen.

Another feature of automobile selling which is bothersome is that some of the popular factories cannot make cars enough to supply the demand. Unlike the carriage and buggy industry, the field is not overflowed, and oftentimes the dealer is confronted with difficulty in getting ample stock. This, however, is fast being overcome, for manufacturers and men with money to invest are now

confident that there is a great future for the making and selling of low and medium priced autos.

All repair men who possess a fairly good field and some financial backing should get in touch with the makers of some good auto that can be absolutely guaranteed and depended upon to give satisfaction. There are a number of such cars made which he can arrange to sell.

Before taking on any line, however, he should satisfy himself that he is getting a reliable car. It is not well to make haste, but to look into the merits of a number of cars before deciding. Be sure that the maker is financially responsible to make good all claims. Be sure that the auto will do all that the manufacturer says it will. See it demonstrated and insist that every car purchased shall come up to the equal of that demonstration.

Fortified with a good line, he must be careful in his selling. He must use care in assuring himself that he will get paid in full. He should always remember that anything that is paid for always gives better satisfaction than something that the owner is in debt for. No car should be delivered until payment has been made in full, either in cash or a note that can be discounted at the bank.

When the car is sold, the agent must always be ready to stand by his guns and make it do satisfactory work. An auto in the hands of a dissatisfied buyer will do much to injure the sale of cars. This is a business that much must be learned by the dealer, but it will pay large profits.

THE SALE DEPARTMENT.

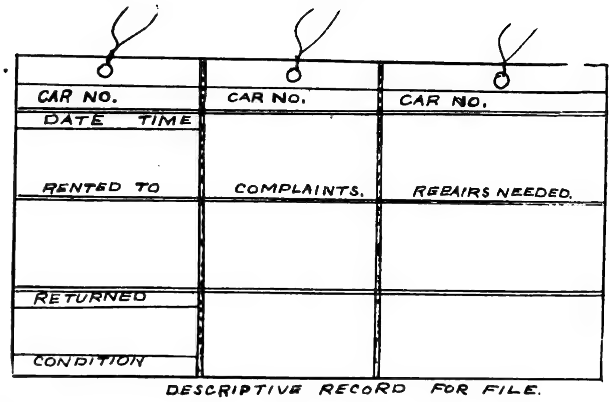
Value of Full Explanation and Running Demonstrations.

Salesmen who are experienced mechanics are in demand. There was a time when the motor vehicle salesman could hold a good position on the strength of his ability to talk and his appearance. But the modern buyers demand something more than common "store manners." It is required of a salesman that he explain minute details of construction, and that he be competent to operate the car to its best advantage for the purpose of demonstrating to the prospective buyer its real worth in actual service. There is nothing like the trial ride to convince a man of the merits of a certain machine.

Of course different houses have adopted different plans for the disposal of automobiles. Some depend upon the attractive display of the machines in the finely finished salesroom. Others employ first-class men to do the exhibiting and talking. Then again some of the dealers believe in the road demonstration. Of course this is taking chances, as you are liable to put your machine in the shop-worn or the second-class department after you have run it over the roads a number of times for demonstration purposes. But oftentimes this act sells the car, even though you get the tires dusty and stained and evidences of use appear at other points on the car.

Nevertheless, the real road demonstration often tells, same as the would-be buyer of a horse makes his purchase after he has tried the animal. Hence, in some of the departments of sales of manufacturers and commission men there are machines in readiness to run out and trained men to run them. These men are expert mechanics as well as salesmen.

The writer has observed the method of operation of some of these men. First, the customer is shown the display of cars in stock. These are usually distributed over the salesroom in such a way that it is possible to examine them readily. The salesman incidentally takes the patron into the supply room, where the different parts of the machines can be seen and explained very easily. Here the patron will see the various apartments for storing the parts, which show him that every part of the machine he may buy can be readily replaced from the stock. Furthermore, there is an opportunity at this point for the salesman to explain the details of any mechanical part of the machine. There are complete combinations kept in stock in readiness, and these combinations can be exhibited to the customer. He can get a very good idea of the principle of construction of any particular section of the machine. Perhaps it is one of the systems of clutches he is interested in. It would not be very easy to get and explain the part if it were on the machine.



DESCRIPTIVE RECORD FOR FILE.

But the part may be placed upon one of the counters and illustrated. When you illustrate any special part to a customer in this fashion, he always takes a keen interest. He admires the simplicity of the mechanism. He may have hesitated in placing his order because he may not have understood the principle of the mechanical motion of some particular part. This fact has caused many persons to avoid buying a machine. But if the part is opened out to the buyer on the counter or floor, so that he may see its workings, he readily sees how simple it all is after all, and he buys the machine.

I have seen men buy machines on the basis of a few lessons by salesmen along these lines. The man who hesitates about placing his order, when he really wants a machine, is the man who does not understand some special part of the mechanical composition of the car. This has been proven time and time again. The undecided man can be brought around if he is taken right.

Salesmen who are careful in the management of a car make the greater percentages of sales. We all know how things will go sometimes. The machine may break down for the first time in weeks, just as you are about to close the bargain with the man. This is annoying, as the buyer is obliged to make his decision on just what he sees and experiences during the trial, and if the machine fails then he is liable to assume that it will fail again. Hence salesmen have been known to get out on the road with a first-class machine and the unforeseen happen. There is a breakdown. The patron oftentimes turns his back on the machine. At the same time the car may be a superior one and may not break down again for months. It is wisdom to carefully examine all parts of the machine previous to a trial run with a would-be patron. You have got to please him. If he finds that you have got to do more or less tinkering on the machine all along the route, he will lose confidence and will go elsewhere to place his money. Still, hard work, faithful service, careful inspections and an understanding of human nature will help out in making a sale.

Grease, oil and dry heat are all injurious to tire tubes and covers. If you use your tires well they will give you at least 25 per cent. more wear.

VALVE TIMING.

And How to Test the Motor and Correct Defects.

Possibly nothing has more to do with the good behavior of a motor than correct valve timing, and the Rambler Company has published some information concerning this important matter that is worth repeating. They call attention to the fact that if the exhaust valves do not open early enough, the motor will be lacking in speed, and that if they close too early the plugs will foul, gasoline consumption will be high, the motor will heat, it will not throttle down as it should, and it will be lacking in power.

The exhaust valves should open about forty degrees before the crank reaches the end of the power stroke and close on or a little after the end of the return or exhaust stroke. This allows the pressure to drop before the beginning of the return stroke and to exhaust as much of the gases as is possible, thus allowing the next charge to be quite pure.

The opening of the inlet valve is not so important, but the closing counts for considerable when it comes to power and speed. When the piston has reached the end of the suction stroke there is a partial vacuum throughout the cylinder and intake pipe, owing to the resistance in the carbureter due to the necessity to insure vaporization of the gasoline, and should the valve close at this point the charge retained in the cylinder would be comparatively small. But if the inlet valve were allowed to remain open until the inrush of the column of air in the intake pipe could reduce the vacuum to atmosphere, then the charge retained would be the full capacity of the cylinder. Thus the larger the charge the greater the power and speed. The most advantageous point for the inlet valve to close varies in different engines from 5 degrees to 25 degrees after center. The longer the intake pipe, the greater the distance after center. Most two-cylinder cars using a single carbureter and long intake pipe work best with the valves set to close at 25 degrees past center.

Should the muffler passage be obstructed in any way the motor will heat, be lacking in speed and power and miss fire. The sound from the muffler will be as a steady stream of compressed air, and when the cut-out is opened the motor will speed up and run better in every way. The cause of such trouble may be due to sooty deposits or a derangement of the baffle plates, caused by a muffler explosion. The only remedy is to remove the muffler, take it apart and put it aright. Unequal power in the cylinders may be due to a derangement in the electrical system, unequal compression or a derangement in the carbureter and intake system.

Having gone over the matter of compression, the electrical system will be considered next. This often requires considerable patience, as a very slight adjustment in some part of the system may be all that is necessary, while in another case it mav mean several very delicate adjustments.

Most likely the trouble may be located in the spark coil or timer. The timer should be gone over first, and all worn parts renewed, for there is nothing sure about a worn part in a timer. Go over the ground wire circuit very thoroughly and see that the lubricant in the bearings of the timer does not interfere with the contact for the ground. Now see that the contact surfaces are good and not burned or roughened and that one cylinder does not fire earlier or later than any of the others, and clean out all grease, dirt and gum and put in a fresh supply of castor oil. See that the terminals and wire connections are good and that there is no dirt on the outside of the timer to cause a short circuit. If the spark advance is controlled by a governor, see that the parts work free and are not worn badly. Adjust the tension of the springs on the weights so that they just hold them in contact with the shaft when at rest. Then examine the spark plugs and high tension wires to see that they are all right; then go to the coil.

See that all binding posts are tight and the vibrator points are clean and smooth. Adjust them so that the vibrator stands about one-sixteenth of an inch from the core of the coil when the adjusting contact screw is not touching the spring. Now screw down the adjusting screw until it makes contact sufficient to produce a steady spark without any sparking at the contact points. A very slight spark at the contact points occasionally is not detrimental. It is only necessary to have the spark jump three-eighths of an inch, and more than that may draw heavy on the battery.

If one cylinder still works poorly, try that coil on one of the other cylinders. If there is no change in the action of the engine, then look for trouble in the intake and carbureter system.

If the car worked right once, it can be made to do so again, providing the cylinders and valve mechanism are in good condition.

Go all over the intake system and make sure that there are absolutely no leaks anywhere between the valves and the throttle. Clean the carbureter out thoroughly and see that the float is in good working order. See that the inlet valve stem guides are not worn so as to allow much leakage, as a very small leak in the intake system won't interfere at high speed, but will cause the motor to act badly at low speeds.

Some Notable Records.

Victories of the Thomas-Detroit.—The Thomas-Detroit won the Rocky Mountain Cup race for stock cars, going 320 miles in 8 hours 25 minutes 58 seconds. In the Giant's Despair Hill climb the car won first honors in the event for gasoline cars from $2,000 to $3,000. In the Minneapolis Endurance run it finished with the only perfect road score among nineteen starters. It also won in its class in the Yale Automobile Club's hill climb at New Haven, as well as at Albany and Cincinnati.

Pope-Hartford Won.—A novel automobile race was run at Butler, Pa., with a 1908 thirty horse power Pope-Hartford, the winner, in competition with two other makes. The course was from Butler to the home of Abram Flick, a wealthy oil man, a distance of twelve miles. Mr. Flick agreed to purchase the car which won the race. The Pope-Hartford started ten minutes behind the first car, but six miles out caught the leader and finished the twelve miles a winner by 9½ minutes.

The Ford a Winner.—Two Ford runabouts defeated seventeen foreign cars in the recent All-Comers' Handicap sweepstake at Brooklands track in London, England. The race was for 7¾ miles, and of the nineteen cars entered only two were of American make, the rest of English, German, French and Italian manufacture. The first two cars to finish were Ford cars.

A Studebaker Victory.—Both first and second honors were carried off bv Studebaker cars in the Portland (Oregon) 100-mile endurance contest. There were twelve starters.

In bolting down a cylinder, or any part secured by more than one bolt, do not tighten one nut at a time, but give each a few turns at a time.

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ADVERTISING RATES MADE KNOWN ON APPLICATION.

NEW YORK, JULY, 1908.

Missing Numbers—Our readers are requested to remember that it always gives us pleasure to re-send numbers which have gone astray in the mails.

ITS USE AND MISUSE.

It goes without saying that when controlled by an intelligent and careful driver, the automobile is the safest vehicle that man has ever used. No other vehicle can be stopped so quickly; no other vehicle is so quick in response to guidance; no other vehicle has such an unconfined sphere of action.

Moreover, the automobile is the most sanitary vehicle that travels the public highways. When used carelessly it leaves behind it the somewhat offensive smell of gasoline—something that will soon be done away with—but it leaves no filth.

Finally, it is less injurious to the highways, weight for weight and speed for speed, than any other vehicle.

These things will be and must be generally admitted. Whom does it offend then? Absolutely no one. The offense in every case is in the operator. He makes all the trouble—his carelessness and ignorance, his lack of consideration for the rules of the highway, for others and for his own safety and for the safety of his machine.

As the automobile will soon come into universal use, it is high time that operators and owners themselves did their part toward placing it on the plane of popularity that its usefulness and necessity require.

No one can or will object to the fullest condemnation of its misuse, which is almost invariably in the direction of speed, but the car itself is certainly one of the greatest steps of progress ever made by man.

NOT FOR SUCH PURPOSE.

The other day the writer came across a party making some slight adjustment or repair of their car, and they occupied fully one-half of the road. Their only and chief concern seemed to be that others had "room to get by," and indeed one car got by rapidly, leaving but about a half inch of space between the two cars.

Now if the passing car had chanced to collide with the standing car and destroyed it, we doubt very much if the injured parties would have been able to collect a penny damages. On the other hand, if the passing car had been destroyed it could clearly have collected damages.

The point is, the roads and every part of them, are designed for travel only, and for no other purpose. They cannot properly be used for repair purposes, or for talking bees, or for loafing, or as a range for any kind of animals, and whoever uses them for such purposes is liable in case of a collision. Yet we very often see cars standing in one-half the road while the occupants are doing some adjusting or are in the fields gathering flowers.

As a matter of safety, and out of respect for a strict observance of the law, when you stop your car for any purpose, swing clear out of the road.

FITNESS OF THINGS.

One reason given for the use of small wheels is that they "improve the appearance of the car." Now appearance—"the fitness of things"—always depends upon the best adaptation of means to ends. There can be no harmonic—so to speak—relation of parts unless each be suited to the requirements for which it is to be used. Wheels of 28 inches on large touring cars do not add to their appearance simply because they undoubtedly increase the rolling resistance on ordinary highways and add to the liability of skidding. The tendency is towards larger wheels, and the average will soon be from 48 to 54 inches. The only objection to this size is the necessity of greater weight of the wheels for the same carrying capacity and the extra cost. It may be added that tests show that the gain going up hill with larger wheels seems to be less than going on a level.

NOT PREPARED.

Mr. Louis Strang, the well-known racing driver, may be popular and talented in some ways, but he is not the man to take "a message to Garcia." Just before the recent great race in France, while entering the enclosure of the track, the transmission and reversing gear of his car jammed and put the Thomas car out of commission.

Now this accident was no fault of the car. If it had been tuned up as any car entering a great race upon which so much depends should have been, there would have been no jamming of the mechanism. Some one was to blame. Possibly it may not have been Mr. Strang directly, but if he left the matter of fitness for the start to some one else, he should have known that the man was reliable and could be depended upon to have the car in the best sort of shape.

It is one-half the battle, either in car racing or in anything else, to be fully prepared.

SET A GOOD EXAMPLE.

In swinging around a curve in the road always keep on your own side. We have noticed in the country again and again, that in making turns there is often a disposition to cut across to the left. This is exasperating, dangerous, and should not permitted even though it becomes necessary to arrest every driver that commits the offense. Many car accidents are due to the carelessness of other users of the roads, but no matter how much pedestrians and children offend in taking up the middle of the road and then jumping to one side or the other just before the car is about to pass—and Omnipotence alone knows which way the jump is to be—car drivers cannot afford to subject themselves to criticism. Recently we heard a pedestrian berate a car driver disgracefully because he cut across to the wrong side of the road when making a

turn, and anything of this sort naturally creates suspicion and prejudice.

Many of the accidents of motor cars are due to the carelessness of other users of the roads, but they all make care on the part of car drivers a more imperative necessity.

TOO MUCH CONFIDENCE.

In running an automobile expert self-confidence as well as ignorance often leads to trouble. About the most offensive users of the highways that can be found are the law-defying supercilious drivers of both horses and automobiles.

It is often forgotten that no matter how great the rate of speed may be which the law permits, the driver still is bound to anticipate that he may meet persons on the public street or road, and he must keep his car in such a control that he may avoid a collision with another person also using care and caution. If necessary he must slow down and even stop. Horn blowing or blatant siren wailing is not enough.

The get-out-of-the-road-I'm-coming attitude is the most offensive of anything that the ordinary user of the highway has to encounter.

SILENT RUNNING.

When new, nearly every car runs quietly. In some cases this noiselessness does not last long, however. Sometimes the loosening of the bolt holding the cylinder to its crank case section may give rise to sounds which are unpleasant compared to the steady purr of the running engine. Sometimes there is a looseness of the moving parts in one or more of the cylinders. Occasionally faulty lubrication of a piston pin or crank pin will cause unnecessary noise. The only remedy for these unpleasant noises is a general watchfulness to see that everything is in the same condition as was the case when the car was sent out of the factory.

Lessons in Court Cases.

Owner Held Guilty.—The owner of an automobile was held guilty of negligence where in attempting to pass a horse and buggy from the rear in a narrow road it could be easily seen that the horse was frightened, and the speed of the automobile was not slackened and no effort was made to allow the frightened horse time to turn out at a cross road nearby. An Indiana statute prohibits the operation of an automobile on a highway at a speed greater than is reasonable and proper, or so as to endanger the life or limb of any person.

In Imminent Danger.—An instruction in a New York court that if when a pedestrian first saw the auto he was in a position of imminent danger from it the question of contributory negligence did not enter into the case was erroneous, as it withdrew from the jury the question whether the pedestrian was negligent in going into the place of danger. "A person may be excused for making a mistake when suddenly confronted with imminent danger provided—and onlv provided—he was without fault in getting into the dangerous situation."

Car Owner Not Liable.—The owner of an automobile was held not liable in Missouri for damages in causing a horse to run away, where as soon as he saw that the horse was frightened he backed his machine and stopped it. The court said: "Respondent was within his rights in running his machine in the street until he observed, or ought, in common prudence, to have observed, appellant's horse was alarmed. As soon as the horse showed alarm, the respondent backed away from it and stopped, thereby doing what he could to allay the fright of the horse and prevent a casualty."

Both Were Neglectful.—An automobile collided with a car in New York and judgment for damages was rendered for the plaintiff. This was reversed on the ground that it appeared that the plaintiff was guilty of contributory negligence in running into the car, rather than the car running into the auto, and there was error in allowing damages for rental value of an auto while this one was being repaired, although no necessitv was shown for the use of any during that time, and it was also shown that repairs were made which were not due to the accident.

Lien on Autos.—There is now a law in New York giving the owners of automobile garages a lien upon motor vehicles for any unpaid sums in connection with repairs, gasoline, or any other supplies or expenses that may have been incurred by the owner of such motor car. In other words, if you don't pay the garage man your little account, he will simply hold up your automobile until you do.

LESSONS FOR DRIVERS.

Carelessness and Ignorance Are Responsible for Accidents.

The list of automobile accidents as reported in the press continues altogether too long. Hasty conclusions naturally lead to the thought that the car itself is responsible for a large portion of these accidents. But this is far from the truth. In fact, the automobile itself causes the most insignificant proportion of them. They are mostly due to careless drivers or to other users of the roads and streets, and the last named class is responsible for a far larger number than it gets credit for. Neither pedestrians nor persons making use of horses or bicycles as a means of travel have any right therein superior to those who use automobiles.

It is worthy of mention that a large share of car accidents are due to turning either one way or the other in passing another vehicle or pedestrian or following some turn in the road. Few drivers are aware of the momentum of a 2,500-pound car going twenty miles an hour. Everything is all serene so long as the car is kept straight in the road, but when an attempt is made to turn, then trouble begins. Naturally, as soon as a turn begins the car skids more or less, and if the outside wheel strikes some firm obstruction in the road over it goes. The same condition results when the car is deflected into the ditch for the purpose of passing some one. As long as it runs straight—one-half is the ditch and one-half in the road—no danger arises, the trouble being in turning into the ditch and turning out of it. Then again comes the tendency to skid, and when the wheels strike anything at a tangent the car overturns. You can run your car half in the ditch as long as you wish, and there is little danger of overturning if the side of the road is not too steep and the center of gravity of the car is low enough. But the instant you turn back into the road trouble begins. It is the getting into the ditch and getting out that causes the liability of accident, especially at high speed.

There are reports this month of scores of accidents which have been due to the foregoing causes. Near Brazil, Indiana, not long ago the driver of a car turned suddenly to the side of the road to avoid a collision with a buggy. His machine was turned over, and of course all the occupants were thrown from it. They were severely bruised and one was killed.

Near Stockton, California, the same kind of an acci-

dent resulted in one death and three severely injured. The car was being turned to avoid a railroad track. Of course the wheels skidded while the car was going at a high rate of speed, and it naturally turned over. It was pretty well demolished.

Here is another instance of a fatality due to sudden turning in the road. A prominent resident of Albany, N. Y., was out in a large touring car, running it himself, when a wagon came along the road in the opposite direction. He was going at a good rate of speed and turned out very abruptly. The car turned over and later the driver was found underneath it with his neck broken.

Occasionally we read of a disaster resulting from the loss of a wheel of a car. This is usually due to a broken axle, and is also often caused by a heavy lateral strain. Near Chicago the other day a physician was riding in his car when a wheel came off. As is always the case, the car veered suddenly and threw the occupants out, although it did not overturn.

Several accidents have occurred recently due to clouds of dust in the road, rendering it impossible for drivers to see any distance ahead. This was the case near Woodbury, L. I., when a lad, who was standing by the roadside in a cloud of dust was not seen by the coming car. It struck him, breaking one leg and giving him other severe wounds.

There are still a good many accidents due to bursting of tires. Tires usually explode when the car is going at high speed or makes a sharp turn. Near Huntington, L. I., the other day a party was trying to catch an express train in a touring car, when the tire burst, swerving the car to the side of the road, where it struck a tree. The car was wrecked and all the occupants injured save the chauffeur.

That any one just learning to operate a car should take a party of friends "out for a spin" is beyond comprehension. But this is often done. In a town near Pittsburg, Pa., a man who had just purchased a new car and who did not know much about operating it, took his wife and two others out for a ride. In some way he touched the reverse lever and the car began to descend a hill backward. It might be going yet had it not struck a house. It threw the party out and all were more or less injured.

In Brooklyn, N. Y., the rear mudguard of a car knocked a man down and fractured his skull and broke his neck. The man was more to blame than the car driver, but there was lack of caution on both sides.

Possibly the most exasperating menace to car drivers in cities is the small boy, who is likely to dodge either way and jump into the street at any time. In Allentown, Pa., a car fully under control ran over a lad and killed him. The driver was in no way to blame. Two lads were playing and literally fell under the car before the driver could stop it. So long as boys are permitted to use the streets as play grounds, accidents of this character will continue to occur, and the most careful driving in the world will not prevent them.

Not only will a depression or a raised obstruction give the occupants a violent shake if the car is going fast, but it is likely to cause the car to swerve quickly and dangerously. Near Morristown, N. J., the other day a lady was driving a car when it sank into a depression in the road, wrenching the steering rod from the hands of the female driver. The car ran violently into a tree and much damage was done.

It should be borne in mind that tires rarely burst when the car is going at a reasonable speed, and even when they do little damage is done. Near Trenton, N. J., the other day an exploding tire of a speeding car caused it to skid and go over a steep embankment. Nobody was very much hurt, but the car was badly wrecked.

Nobody who has any regard for his life or for the lives of others will drive a car at night more than half as fast as he would in the day. Distances are deceptive when the light is not good, and a good many dangers may be encountered that vehicles drawn by horses and going at six or seven miles an hour never experience. Near Seattle, Wash., not long ago, a married man, who would better have been at home, went out with a crowd of girls, on a lark probably, and the ride ended in the river. The speeding car hit the railing of a bridge and five persons plunged into the water below. They were ultimately rescued, although one of them afterward lost his life.

Here is a case somewhat similar to the foregoing. A party of young ladies and a physician were taking a ride near St. Louis, Mo., and were speeding up "just for fun." The doctor put on the brakes in order to make a turn, and as a result the car turned over and all of the occupants were thrown out and more or less injured.

When children play tag in the road, beware. They are as likely to run under a car as they are to run from it, and eternal vigilance is the only price of safety. Some boys were playing tag in the streets of Reading, Pa., not long ago, when one of them ran directly in front of a car. He was thrown some distance and picked up unconscious. The automobile driver was in no way to blame.

At Portland, Me., the other day an automobile and a wagon crashed together, and a woman in the car had her leg broken. There seems to be a disagreement as to whether the car was on the right side of the street or not, but nobody disputes that it was going at a rapid speed. This, in fact, is the cause of fully 90 per cent. of all automobile accidents. In the case referred to the horse was badly injured and the damage all around was serious.

There may be a slight lesson in the following disaster, wherein a passing automobile struck the front wheel of another car. The steering gear was broken and the car turned at right angles in the road. The colliding car was thrown down an eight-foot embankment and everybody was pretty well shaken up. The trouble was due to too much haste and to not turning out far enough or keeping out of the road until the other car was passed.

Straining the Steering Arms.

Occasionally one sees a garage attendant move a car from one place to another, wrenching the front wheels round by means of the steering wheel with the car stationary. As the steering gear enables one to put a great deal of power into turning the front wheels, the stress on the steering arms is very great, and consequently they are liable to be bent, and, in fact, do become bent out of shape, with much handling in this manner. Attention has been called to the ill-effects resulting from straining the front wheels with the steering gear wheel when the car is stationary, and it is a practice which should never be allowed. Although steering gears are called irreversible, and they are so as a rule, the front wheels can generally be taken in both hands and pulled across to the required angle, especially if the steering wheel be set over in the right direction. This, of course, does not strain the arms in the least.

Running Backwards.

It is a good thing to be able to steer a car rear end first in case it becomes necessary, through the disablement of the forward gears or other accidental damage, to resort to this method. Occasionally something will go wrong on a hill, making a hurried backward descent necessary, or a hill may be met which is so steep that it can only be climbed on the low reverse gear.

THE REPAIR SHOP

IGNITION TROUBLES.

How to Locate Them and How They May Be Corrected.

BY SYDNEY F. WALKER.

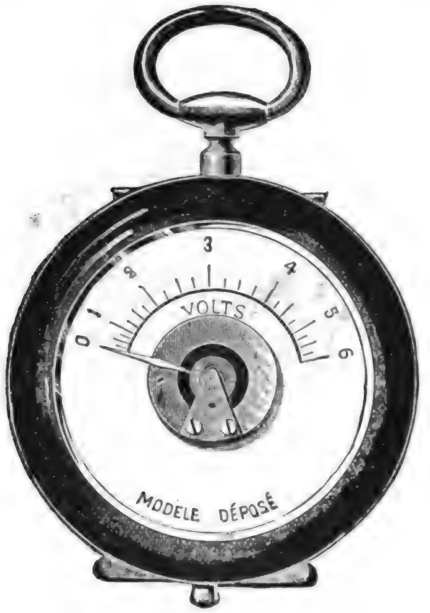
In the case of the automobile repairer, when a car is brought in with ignition trouble, it is wise to ask a few questions, very much as a doctor does. If, for instance, the owner reports that his battery was charged up last night and that he started out apparently firing all right, and that after he had run a little way it began to miss, and the misses became more frequent; or if he reports that he has had the battery running for a certain time and it has worked well, but has gradually taken to missing, the misses increasing in number as he gets away from his starting place, the probability is that the battery is in fault. If, on the other hand, he reports that the firing is all right, but the engine goes strong and suddenly it misses fire, without any apparent reason, refuses perhaps to fire for some time and then commences to fire again all right, goes on firing for some time without any trouble and then as suddenly ceases, the trouble is probably in some other part of the apparatus. Further questions will usually elicit further information. He may have had a new coil, or a new commutator, or he may have done a bit of cleaning up, or something of the kind.

In all of these cases experience counts for a great deal. The man who is constantly overhauling cars, and particularly ignition outfits, will become skillful in putting questions, the answers to which will lead him, if not right to the trouble, very nearly to it. If the breakdown is complete, that is to say, if the spark refuses to pass at all, the rules for locating the trouble are very simple and consist in testing the apparatus right through, on the lines to be given.

Commence with the battery, no matter whether it be a dry battery or an accumulator. Test each cell by itself with a volt meter. A hint may be given here. The man who looks after ignition troubles at an automobile repairer's will be wise to keep his instruments entirely to himself, not to let any one else touch them. Further, he will be wise to test them as often as he can against standard instruments where it is possible to do so, or to make checking tests, such as testing cells that are known to be at full power, and so on, just as he does with his watch. The volt meters that are sold for testing ignition apparatus, if well made, are thoroughly satisfactory, provided that expense has not been incurred in making the instrument look pretty, and in making especially delicate, the most expensive instrument ought to be the most reliable. A good instrument, carefully handled, in the hands of an intelligent man, will give an enormous amount of information. The small watch-shaped volt meter and the watch-shaped ammeter will enable the man who looks after the ignition outfit to practically locate any fault in a very short time. The work becomes exceedingly interesting when you get into it. It is like hunting when the scent is very thick.

TESTING THE BATTERY.

To test the battery, first see that the wires on the volt meter are properly screwed up, that is to say, that the terminal screws have got hold of the ends of the testing wires firmly, and see also before connecting the testing wires to the volt meter that the ends are thoroughly clean. Covered wires, when first stripped, are dirty. The rubber or other substance with which they are covered adheres more or less to them, and a layer of the substance will partially prevent the current passing through to the wires, and the test will be false and misleading. Again, if a pair of wires are used for testing that have been lying about in the works, their ends having been stripped some time before, the bared ends will probably be dirty, partly from oxidation and partly from dirt which settles more or less upon every metallic surface. Clean the ends of the wires thoroughly before putting them under the terminal screws of the volt meters. Clean the other ends or the wires also. Probably the handiest method of cleaning the ends of testing wires is by scraping them



FOREIGN-MADE VOLT METER.

with a pocket knife, but if a piece of emery cloth is handy it is better, because there is less chance of nicking the wire and having a break later on.

Having secured the testing wires to the volt meter and cleaned the other ends, hang up the volt meter, or support it in some way so that it cannot be easily pulled over. One of the great troubles met with in testing batteries, etc., is that the testing instrument is very often pulled over by accident when bringing the testing wires in contact with the battery termials. It is wise to have good long testing wires, and to have them in separate coils, so that they can be easily pulled out and easily coiled up again. If the volt meter falls down, say from the motor car to the ground, or if it falls over and, being caught by the testing wires, is banged against the wheel, its pivot may be bent or one of the wire connections to the terminals inside of the volt meter may be broken and the test will be upset.

Before attempting to test the battery, carefully clean places on each terminal of each cell to be tested with the knife. The same remarks that were given above as to the necessity for the ends of the testing wires being clean apply with even greater force to the terminals of the battery. Be careful that the places where the testing

wires are to be placed take in one cell at a time. An examination of any battery, whether primary or secondary, will show that each cell has two terminals, one positive and one negative, and that the negative of one cell is connected to the positive of the next, the negative of the second cell, where there are more than two, to the positive of the third, and so on, the positive terminal of the first and the negative terminal of the fourth being left free. If the positive terminal of the first cell and the positive terminal of the second cell, or a piece of the wire connected to the negative terminal of the first cell, are bared and the ends of the volt meter wires are pressed firmly on to these two points, a circuit is formed, in which the one cell and the volt meter are included. To test the second cell the testing wires are moved on to the positive terminal of the second cell and the positive terminal of the third cell, or to the wire connected to the negative terminal of the second cell. For testing the third cell, where there are more than two, the testing wires are moved to the positive terminal of the third cell and the positive terminal of the fourth cell, and for testing the fourth cell the testing wires are moved to the positive terminal of the fourth cell and the free negative terminal.

With dry cells the positive terminal is usually a screw in the middle of the cell, the negative terminal a wire

AN AMERICAN-MADE AMMETER.

attached to the zinc cylinder which forms the negative plate, and which is just inside the containing porcelain or cardboard cylinder. Connecting the wire that is attached to the zinc cylinder of the first cell to the screw in the middle of the second cell, and the wire attached to the zinc of the second cell to the screw in the middle of the third cell, and so on, connects the cells together in series, and it will be seen that the positive terminal of the second cell being connected to the zinc wire of the first cell may be used as a testing point for the first cell or any part of the zinc wire of the first cell. With accumulators the connections are usually made by lead straps.

It will be perhaps wise to test each cell individually and the battery as a whole. In certain cases, where time presses, it may be the most convenient plan to test the battery as a whole with the volt meter, and in that case the test is made by pressing the two bared ends of the volt meter testing wires, one on each of the end terminals of the battery. In the case of a battery of dry cells one of the testing wires will be pressed on the terminal screw in the center of the cell at the one end of the battery, the positive end, and the other testing wire will be pressed upon the loose zinc wire at the other end of the battery, the negative end.

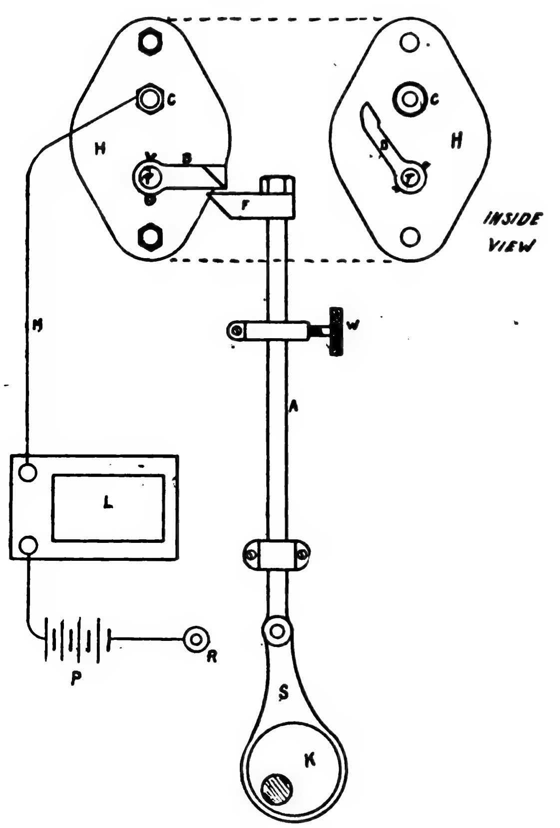
In the case of accumulators one testing wire will be pressed against the strap or terminal at one end of the battery and the other wire against the strap or terminal at the other end of the battery. The same precautions as to cleaning the terminals, the straps or the wires that are to be brought into contact are to be observed. Further, in all tests of this kind it is exceedingly important that the testing wires should be pressed very firmly against the terminals of the batteries to be tested. This precaution applies in all tests. Firm contact is of the very utmost importance in all electrical action. Loose contacts are one of the most frequent sources of trouble with electrical apparatus, and a testing wire loosely in contact with the terminal of the battery it is to test, or the instrument it is to test, or the wire it is to test will give very misleading results, because it will be almost an accident if a current passes through the testing instrument, though everything up to the point tested may be in order.

Ignition batteries are arranged to give 4 volts, and to continue to keep the spark going, down to about 3½, or in the cases of very good coils, and where everything is in very good order, down to 3 volts. Accumulator cells furnish 2 volts each on what is called open circuit, when freshly charged, but they begin to fall from the moment of charging, and when they reach 1.7 to 1.8 volts per cell it is time to recharge them. By open circuit is meant when no current is passing in the outer circuit. That is to say, when the battery is disconnected from the remainder of the apparatus, or the switch is so arranged that no current is passing. Where time is of importance batteries can be tested without disconnecting their terminals from the wires leading to the coil, etc., by merely scraping clean places on the terminals or connecting wires, as explained. But if other troubles, such as are explained below and that have been hinted at above, are suspected, disconnections, or what are termed short circuits, connections between wires that ought not to be connected, and that are draining the batteries, it is wiser to disconnect the batteries before testing.

Dry cells are supposed to give 1.5 volts each on open circuit, but it is very rarely that they give more than about 1.3. The total pressure given by four dry cells in series, when no current is passing in the outer circuit, and therefore when no current is passing through the battery, will be 5.2 volts. It will be seen that this is considerable in cases of the 4 volts, or the 3½ volts that the coils and other apparatus are made to work with, but the increased voltage is necessary because the cells themselves have very much more resistance than the accumulator cells. When a battery cell, whether accumulator or dry cell, is tested on open circuit the voltage it gives is the very highest it can give at the moment. It corresponds to the indicated horse power of an engine. But immediately a current is taken from the battery the battery itself makes a charge upon the pressure for allowing the current to pass through itself, just as an engine makes a charge upon the indicated horse power for its own friction. The charge made upon the total pressure of the battery depends directly upon the strength of the current that is passing and also upon the resistance of the cells. Hence, dry cells having a higher internal resistance than accumulator cells, the initial pressure given by the individual cells must be higher than that given by the accumulator cells in order that the same current may pass, and that there may be the same pressure at the terminals of the induction coil. This is why four dry cells are employed and only two accumulator cells. One hint may be given here. The internal resistance of all cells, whether dry cells or accumulators, is inversely as the size of the cells. Thus, doubling the size of the cells approximately halves their individual resistance. Further, doubling the size of the cells very much increases their staying power, their ability to go on working and furnishing ignition sparks. One hint that might be given to motor car owners is, double the size of your accumulator or dry cells and you will find that your ignition troubles are consid-

erably reduced. The voltage furnished by the battery of dry cells on open circuit should not be less than 4.5 volts, or in very special cases 4 volts. When 4.5 volts are reached the battery should be overhauled. Another hint may be given with regard to batteries. When a battery is tested for the full pressure between its terminals and it is found that the pressure is below what it should be for proper work, it may be due to one of the cells being very much run down, the other or the others being in good condition. This is discovered by testing the cells individually. In the case of dry cells it is a simple matter to replace a bad one, and, providing that stock is kept of the particular pattern of accumulators, the same thing should be applicable to accumulators. The failure of the bat-

FIGURE I.



tery may also be due to all of the cells having deteriorated to a certain extent, and in that case there is nothing to be done but to replace, or recharge, the whole of them. It should be noted that both accumulators and dry cells recover themselves after standing. In the case of the dry cell the breakdown is partly due to the accumulation of gas around the carbon plate which forms the positive pole of the cell. When the cell is allowed to stand for a bit, without work, this accumulation of gas clears away and the cell will go on working again for some time. It is, however, very unwise to trust to this. The accumulation of the gas is only one of the causes of the breakdown, and it is partly a sign that other causes of breakdown are at work, such as the formation of the secondary salts that are produced in the working of the battery, and if the battery is allowed to go out again the result will probably be that the cells will break down again after a short time and will stop the car. On the other hand, if the dry cells are removed from the car and placed in a cool position in the works, they will very often recover themselves sufficiently to do a moderate amount of work. This is providing that they have not been worked too hard. It is, at any rate, worth the trouble of standing them on a shelf and testing them periodically, to see if they get up. In the early days of electricity the present writer used to look after a number of electrical signals in mines, and he made it a practice when visiting individual batteries to take off cells that showed signs of weakness and to place them on one side until his next journey. In many cases the cells sufficiently recovered themselves to be put on for another few months and to do good work during that time.

In the case of accumulators the breakdown is due to the chemical actions which go on during the discharge of the cell, and if it is allowed to rest other chemical actions take place, which temporarily restore the cell, very much as the dry cell is, but it is very unwise to allow a cell that is apparently restored to go out again upon a motor car. If once the voltage of a cell comes down to 1.7, do not let it do any more work until it has been recharged.

It should be mentioned that in the case of the new Edison cell the limiting figure is, the writer believes, 1.1, the cell starting at something like 1.3 or 1.4.

If the battery is at fault, change the cells, do not tinker them, and probably the trouble will be got rid of, particularly if the battery is very much run down.

TESTING THE MAKE AND BREAK SYSTEM.

If it is not the battery, the whole apparatus must be tested through, point by point. The operation looks formidable at first sight, but it is really not so when once a little practice has been obtained at it, and any intelligent man will be able to very quickly test the two circuits and to locate the trouble with absolute certainty. The one case in which he may have considerable difficulty is where the fault is intermittent, where it comes on for an instant and then disappears. The circuit may be tested with the voltmeter alone, but the writer would strongly recommend that the ammeter should also be employed. He would also mention that where there is time an ammeter test of the battery, cell by cell, is also useful. With practice and with instruments that are known to the tester, the two indications, the voltage and the current that a battery will throw through the ammeter alone, will give very valuable information. The voltage test does not always show that the resistance of the cell may have gone up; the two tests with voltmeter and ammeter will show it to a certainty. Similarly by connecting the ammeter in the circuit and using the voltmeter to test from point to point, accurate indications may be obtained of any source of trouble. In the case of the make and break system the wire connected to the terminal R, Fig. 1, may be disconnected from the terminal and the ammeter connected between R and the wire that has been removed from it. The connection is made by using two testing wires clamped under the terminal screws of the ammeter, in a similar manner to those used with the voltmeter, and having bared the free ends of the two testing wires, connecting one to the terminal screw R and twisting the other round the bare end of the wire that has been removed from R. The object of placing the ammeter in the circuit is to show exactly what is taking place when the apparatus is worked. The ammeter by itself will show to a certain extent without the voltmeter, but the two will make a much quicker job. In the first place, having the ammeter in the circuit, and working the make and break by hand, the ammeter will show whether the current passes at the moment it ought to, and if it passes when it ought not to. Many electrical ignition troubles are due to currents passing when they ought not to. In the make and break system the current is to pass at a certain instant, and during the remainder of the cycle no current is to pass, and the ammeter will show if the current is passing during any portion of the cycle. Assum-

ing that there is a break in the circuit, a very common source of trouble, the ammeter will show no current when the make and break is worked by hand. The next step is to short circuit the make and break, as it is called. To bridge over the make and break by connecting a wire from the terminal C to the frame of the machine anywhere, or, to be more certain, to the terminal R, it may happen that the ammeter will now show a current, and if so, it will indicate that the trouble is in the make and break apparatus, and further examination will probably reveal it. If the break, however, is elsewhere, the ammeter will still not show a current, and there are two methods now of locating the trouble. It may be mentioned that a common trouble in cases of this kind is the breakage of a wire from its terminal, such as the wire inside the coil breaking off the end of the screw inside, to which it has probably been soldered, or the wire connected to the terminal C, and leading from it to one terminal of the coil, may not be making proper connection with C. There may be a broken wire right inside the coil itself and there may be others. The test may be made with the ammeter alone by removing the test wire of the ammeter from under the screw R and touching it successively, but always firmly, on the terminals of the coil and on the terminal C. In each case a clean place must be made upon the terminal, or upon the end of the wire connected to it, for the purpose of making the test, and the testing wire must be pressed firmly upon the cleaned place. When the testing wire is pressed upon the terminal of the coil nearest to the battery, as shown in the diagram, the battery should give its full current. If it does not, the fault has probably been found, and it will either be in the wire leading from the other end of the battery to that terminal of the coil, or in the connection of the wire to the terminal itself. Further examination will discover it. When the testing wire is pressed on the other terminal of the coil the deflection of the needle of the ammeter will be less than when it was pressed on the near terminal of the coil, because the resistance of the coil is now interposed in the circuit. It may happen that the resistance of the coil is so great that the indications of the ammeter are very small. The construction of ignition coils varies very much, and therefore this caution is given. With the majority of coils a deflection of the ammeter needle would be attained less than that at the first terminal. If no deflection is obtained at all, and if there is no appearance of any shake of the needle, it is probable that the fault is in the coil. And here is where the use of the voltmeter comes in. Leaving the ammeter testing wire connected to the terminal R, as described, the voltmeter testing wires are first pressed upon the terminal R, and the near screw of the coil, when the full deflection due to the voltage of the battery should be obtained. It is wise to make this test to see that everything is in order for testing. In testing work, especially in repairing shops, or when testing on the motor car itself, it is quite easy to make a slip, to leave a wire disconnected, or something of that kind. Having tested from R to the near terminal of the coil with a voltmeter, now test from R to the farthest terminal of the coil. If no deflection is obtained, the trouble is found; it is in the coil, and further examination will show it. If not, the coil itself must be replaced. If the coil shows correctly, the test must be conducted further to the terminal C. If no deflection of ammeter or voltmeter is obtained when test is made from R to C, the trouble is probably in the wire connecting C and H, which must be replaced. It will be seen that the method of testing for this form of apparatus is exceedingly simple, and though it takes a little time to describe, it is very easily carried out, indeed.

(To be concluded.)

POPULAR REDS.

Details of Painting the Car These Colors Briefly Explained.

BY M. C. HILLICK.

The reds, for various and adequate reasons which need not here be explained, are immensely popular automobile colors, and in this article it is purposed to explain the processes involved in painting some of the leading red auto surfaces.

This season, for example, one may encounter the light carmine surface speeding along shady boulevards oftener perhaps than any other red. To build up one of these brilliant surfaces proceed as follows:

Whether the surface is new or old, work it down as smooth and fine as possible, for success largely depends upon both the levelness and smoothness of the foundation. Then to Tuscan or Indian red, whichever is handy at the time, add some flake white to coax the red to a tint a bit darker than a standard peachblow color. Beat the mixture out fine and smooth in its parts, and if the red be japan ground, and the white likewise, add a teaspoonful of raw linseed to a thinned pint of the pigment to insure binding properties. Apply with a camel's hair brush, and lay the coat on clean and free from all brush marks. Next thin some japan, ground flamingo or flaming red with turpentine, add a dozen drops of raw linseed oil to a pint of the red, and lay on with a camel's hair brush a thin coat.

The next coat should be prepared of one part of either of the above reds and two parts of japan ground No. 40 carmine, procured, preferably, in collapsible tubes of the ¼-lb. size. Whip this to a rather thin consistency with turpentine, and apply as a flat coat with a camel's hair brush. Over this enriched ground color in due time flow a glaze coat of pure No. 40 carmine, using ½ ounce of carmine in a scant pint of elastic rubbing varnish. For applying this glaze use a 2½ or 3-inch, chisel pointed, half elastic, flat bristle brush. Follow with the usual finishing processes.

Since the automobile first swept its aristocratic proportions into the presence of the American people, maroon has held a conspicuous place in the estimation of colorists. To build up a maroon lake surface, fetch the surface up as advised for carmine and apply with a camel's hair brush a ground coat made of Tuscan red with enough deep orange chrome yellow added to brighten it. Over this coat, when dry, lay a flat mixed coat of the maroon, using, as in previous cases, a camel's hair brush of a size to fit the surface. Permit this coat to harden perfectly, and then glaze with the maroon lake, using ¾-oz. of lake to a pint of elastic rubbing varnish. Then finish above this in the customary way.

For either American or English crimson lake, of which color the observer will note many beautiful examples upon 1908 automobiles, use, upon a nicely groomed foundation, a Tuscan red, flushed with deep orange chrome yellow, worked thin in the pail with turpentine and bound with a dash of raw linseed oil. Upon this red apply a coat of scarlet lake (English) thinned with turpentine to dry flat. Upon this lake flow a glaze coat of the crimson lake. With this lake, as with all those above referred to, a second coat of the glaze should be applied if a deficiency in solidity of the color is noted. All lakes to really look distinguished and magnificent must have depth of tone, a quality which cannot be had except the body of pigment be deep enough to show a perfect uniformity of color.

English purple lake, a wonderfully rich, dark lake, with a flush of royalty to it, seen along suburban driveways

upon light touring cars confined principally to city service, but really adapted to any good roads service, should be first applied as a flat color over a ground of coach black, or ivory black. Then glaze the purple on in a flow of elastic varnish, using two-thirds of an ounce of the lake to a full pint of varnish.

The wine colors, more particularly the medium shade, plentifully seen upon automobiles this season, may be first used in a flat state over an Indian red ground color. Then apply as a glaze color in a rich flow of varnish. All wine colors should be kept well protected with varnish.

Care of Storage Batteries.

During the first part of the charging operations, when the battery is new, it will be noticed that the specific gravity of the dilute acid is lower than when it was first mixed. This will increase as the charging is continued. It occasionally happens that one cell remains low, in the case of a battery that has been in use some time, which indicates very clearly that it has been run down more than it should have been. It is a wise precaution to take, in such a case, to uncouple the cell in question and move it to the end of the battery among the regulating cells, one of them being connected up in its place. It can be arranged that the charging up is done for a time with the charging switch on the top bar, so that the weak cell is in the charging circuit, but further arranged that for a time the discharging switch shall only work on the second or lower contacts, so that the particular cell is not discharged with the others. A few days of this treatment will soon bring up the specific gravity of the electrolyte; but if it should remain obstinate, a thorough examination of the plates, removing them for the purpose from the glass jar, for short-circuiting may possibly reveal a fault that the customary morning examination for dropped pieces of scale may have failed to disclose. If nothing appears wrong, and the acid still remains low, it is time to syphon this off into an earthenware bowl, together with the acid out of two of the best cells, and thoroughly mix the electrolyte together, adding new pure sulphuric acid in small quantities until the correct point of gravity is reached. If the cells have lost a portion of their acid it is well to remember that this is due to evaporation and decomposition of water during charging. The only portion that has been lost is, therefore, some of the water, and the cell should be filled up until the plates are well covered with pure distilled water. On no account should either town, rain, or well water be used, as the chemicals they contain are always injurious to the battery.

Repair Charges.

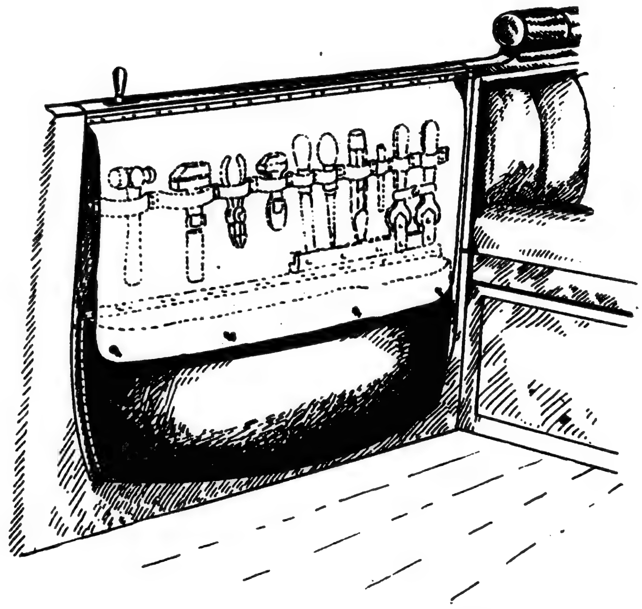
Car owners often feel that they are imposed upon by repair men, and quite likely they are sometimes right. But this ruling would frequently undergo a considerable modification if the owners were able to see behind the scenes of such a business for a long enough period to grasp some idea of the unavoidable expenses of running a repair establishment. Many causes conduce to this state of affairs, the diversity of the work with which a motor mechanic has to cope being not one of the least. It is one thing to turn out in hundreds consecutively a given part of a motor car by means of automatic mechinery. It is quite another thing, however, to be suddenly called upon to make one or two of the parts exactly to match in a desperate hurry with the ordinary plant of a repair shop. Very likely a less urgent job has to be temporarily abandoned, a special tool made, and the article itself produced out of the nearest size piece of material at hand.

This material may be a piece of phosphor bronze or cast steel bar considerably larger in diameter than is really necessary, but neither time nor the expense of obtaining something nearer will warrant the repairer doing otherwise than pairing down at the cost of extra time and waste of material what is ready to hand. It is all very well to say that repairers should carry a stock to meet all contingencies; people who babble thus have not the faintest idea of the cost and diversity of such a stock.

Then, again, comes the loss through having to scrap faulty castings or pieces of steel that are cracked or warped in hardening after a lot of expensive labor has been used on them. Who is to stand the expense of all this? It is impossible to charge it to the owner of the car, for it is no fault of his. If it is a casting which is found to be useless on account of being spongy or having blowholes, the most that the foundry will do is to allow, with more or less bad grace, scrap metal price for the casting or to replace it free. But the labor is lost.

A Simple Tool Carrier.

From E. W. W., Indiana.—The chief objection to carrying tools loose is the difficulty in locating the tool required, while a tool roll must be found, undone, done up, and replaced each time a tool is required. My suggestion for overcoming this can easily be grasped from the accompanying drawing. The idea consists in attaching a tool-carrying strip to one or both of the side doors, the strip being arranged loosely, so as to form loops in which the tools are carried, as in the ordinary tool roll. A back-



ground should be made of baize, of the same color as the car, so as to prevent any noise, and the tool carrying strip may be of the same material or of leather. A patent leather flap can then be attached to the door, so as to cover the row of tools. A neat method of attaching the flap is to first separate the upholstery from the woodwork, then insert the edge of the flap, the upholstery being replaced so as to hold the flap. Beneath the row of tools can be arranged a pocket as shown, to carry odds and ends, or such tools as cannot be carried in the loops.

This idea can be improved upon as shown at the right hand part of the sketch. Here is shown a wooden channel which is attached to prevent the tools falling through the loops, while further to the right are shown spanners, which are supported by bevelled tongues of wood, and secured by a wooden cleat which clamps both the spanners in place. These cleats and wooden carriers can be devised for each individual tool, but this has not been shown the whole way along the sketch in order to show clearly

the development of the idea. Many cars have side doors to the front seats, and many two-seated cars are provided with these doors. Fitting the tools in this way to the left hand door allows them to be very easy of access while the tools can be put back into place when the car is moving, which is often an advantage.

Exact Ignition Adjustment.

There are cars on the market fitted with V engines and an ignition worked by two vibrator coils with make and break contacts. It has been remarked that when a team of these cars happen to run in the same hill-climb, one car will win in a common gallop, while another may be as much as two minutes slower in its ascent. The explanation is that these engines require great exactness of ignition adjustment, as any carelessness leads to one cylinder pulling more or less against the other. No mere makeshift adjustment of this particular ignition will produce a winning speed. The first point to look to is the coil vibrators, which must first be set till both give the same note, betokening an equal rate of vibration; what the note is, is of less importance than that both should give the same note; but a note which is at once high and resonant is desirable. The adjustment of the coil vibrators should then be firmly locked, and attention transferred to the engine contacts. Select one cylinder and, entirely disregarding the second cylinder. try various adjustments of the platinum screw on the engine contact breaker, until the chosen cylinder is running as fast as it can be made to run (testing its speed by ear while cutting out the second cylinder altogether for brief intervals by short-circuiting its sparking plug with a wood-handled screwdriver). When this chosen cylinder is running as fast as it can be induced to do, lock its contact adjustment and stop the engine. Remove the exhaust valve cap from each cylinder, and feel with a wire for the piston of the chosen cylinder, setting it on the exact top of its compression stroke. Switch on the current, and move the spark advance lever till the coil vibrator of that cylinder is heard to buzz. Leave the spark advance lever in this position, and revolve the engine by means of the starting handle till the other cylinder's coil is heard to buzz. Feel with a wire for the piston of the second cylinder. If the piston of this second cylinder is not like the first, that is, on exact top of compression stroke when the vibrator buzzes, its engine contact screw must be adjusted until the buzz coincides with the top of the piston stroke, great care being taken not to alter the setting of the spark advance lever. When the coil of the cylinder buzzes when the piston is on the dead center we know that cylinder No. 1 is perfectly adjusted; cylinder No. 2 is synchronised in exact harmony with cylinder No. 1; and the result of these adjustments is to add an extraordinary degree of life and vim to the engine. These precautions are only essential for competition work. In ordinary road use it is sufficient to start the engine, half retard the spark, and short each sparking plug in turn with a screwdriver, noting which cylinder sounds the slower running of the two. The engine platinum screw of the slower cylinder should be tightened until both cylinders sound equally lively.

Solder for Aluminum.

The solder consists of aluminum, 5 parts; antimony, 5 parts, and zinc, 90 parts. To make it harder, use a little more antimony and a little less zinc.

The aluminum is first melted in a pot. When this is melted add the zinc. When the zinc is melted add the antimony. The metal is then thoroughly puddled with sal ammoniac. When the surface of the metal is quite clear and white, it should be poured into sticks ready for use, the cinder being first removed.

To make a joint in aluminum with this solder, the two or more surfaces to be jointed should be cleaned, either by scraping or using acid, and the surfaces should be well coated with solder, special care being taken that the solder has to some extent penetrated into the surface of the metal without, at the same time, burning it. The parts to be joined should now be placed together and kept in close contact. Heat should then be applied until the solder melts; any surplus which squeezes out should be wiped off witn any convenient instrument, and the heat removed.

The following instructions should be followed when soldering aluminum: Clean off all dirt and grease from the surface of the metal with benzine, apply the solder with copper, and when the molten solder covers the surface of the metal, scratch through the solder with a wire brush, by which means the oxide is broken up and taken away. Quick manipulation is necessary.

A Home-Made Car.

From Godfrey Lund, Nebraska.—I enclose a photograph of an automobile that I have been building in my spare time. It is 20 horse power and will make 40 miles an hour. I have not found a hill that is too steep for it, and when it comes to mud and sand it goes nearly any-

A HOME-MADE CAR.

where that a horse and wagon can go. I have sent it through mud and sand up to the rear sprockets without any trouble, and have never had a puncture, for my tires are of solid rubber. I can always stay in the wagon track and that is qute an item in this country, where we always have a wheel track from ½ inch to 12 or 14 inches, and outside of that track it is generally rough. I use four full elliptic springs 36 inches long, and that is what makes it ride so easy. Those who have ridden in this machine claim that it rides nicer than cars with pneumatic tires.

[Note.—We should be glad, if Mr. Lund feels so disposed, if our correspondent would give further details of how he built this car. Where did the various parts come from, and did you succeed easily in assembling the car? About how much do you estimate that the car has cost you? Information of this sort would be interesting to our readers, and Mr. Lund will confer a favor by giving it, if possible.—Editor.]

A good driver will always know that his brakes will stand the test; he will not do any guessing or take any chances.

Repair and Care of Tire Casings.

The casing may be injured severely without hurting the inner tube, or a slight casing puncture by a nail or similar small article may put the inner tube out of service at once. In most cases, however, where the casing is severely injured, the inner tube suffers. To repair the casing block the wheels of the car with anything handy, then jack the axle up so the proper tire will be clear of the ground. If the puncture is small which has gone through the casing, it can be temporarily fixed up by applying a cloth and leather patch to the inside with solution carried for that purpose. This will keep the inner tube from coming in contact with the rough edges of the canvas. Many make no effort to fixe the tread in case of a small puncture, but a cut which penetrated through the canvas should be vulcanized as soon as possible to keep moisture from entering and rotting the canvas. A repair in the tread may be made by opening and cleansing the cut with gasoline on a rag, and then applying a coating of good rubber cement in the cut and on the exposed fabric. The cut should then be held together for a short time until the binding is effected. For a larger cut the tire should be inflated to 14 lbs. pressure and a leather gaiter firmly laced on it. The gaiter should also be fastened to the spokes to prevent creeping. The tire can then be inflated to full pressure.

For a blowout insert a blowout patch inside the casing, which will hold the inner tube safely without friction, and apply a rubber protector outside underneath the gaiter or hood and between rim and tread.

Or cut a piece of prepared canvas larger than the hole and carefully cement it inside the casing. After giving it time to dry insert the inner tube and parity pump. Then attach the rubber protector and gaiter as previously instructed, after which fully inflate the tire. Tire trouble can be lessened by having demountable rims and carrying two extra inflated tires.

Morgan & Wright Rubber Works lay stress upon the importance of proper inflation in the following terms:

The proper inflation of tires is a point which cannot be watched too carefully. A tire under-inflated will not stand the wear and tear that a properly inflated tire will. Under service conditions there is a distinct action of the threads upon one another. This is equivalent to one thread sawing another, and it may be largely obviated by proper inflation. Heat is generated by this action or internal friction, analogous to the heat developed by rapidly bending a wire. The heat will destroy the friction coating, then the threads will saw one another apart and a fabric rupture is the result. This adds to the wear and tear at the points of expansion and contraction which extends nearly through the entire circumference of the tire. Under inflation also causes fabric ruptures. Observe the inflation not only under usual load, but when every seat in your car is filled. When tires are properly inflated they should stand up round under the full load the car is designed to carry. All fabric stretches, whether it be a thread or a hawser, hence after a new set of tires has been run several days they will need additional air. Keep giving them attention until the stretch has disappeared.

Look Out for the Steering Rod.

As is well known, accidents have sometimes occurred owing to the dropping of the steering rod after the bearings have become worn. To obviate this in some cases a suspensory spring has been affixed as shown in the illustration. The clips on the lever and rod can be so adjusted as to put a nice tension upon the spring, and at the same time not in any way to interfere with the freedom of the steering. It should be clearly understood that this device will not obviate the necessity for frequent careful examination of the cup bearings, as it is quite conceivable that if they were allowed to become loose enough the rod might jerk out despite the spring, though the chances of it doing so are very greatly reduced. In many cases the front end of the rod used to be wrongly positioned, though this has been rectified in most cars. The rod should be above the lever at the front and not below it. When it is below it is often difficult to fit any sort of suspensory arrangement, and the best thing to do is to have it properly refitted with the rod on the top of the lever, though this is not always possible without a great deal of very expensive work, and in this case one must examine the steering very carefully at regular intervals to see that it is perfectly right. It is just as dangerous for the front end of the rod to fall as the back end. Even if the car were going very slowly, so that there was no great danger, the steering rod would be wrecked, as it would act for the moment like a sprag, so that it would double up instantly and probably damage the lever and the steering box.

Loss of Compression.

Some cars puzzle their owners owing to a loss of compression on long mileages. They have ground in the valves, attended to the valve plug and sparking plug joints, and yet the engine is easily turned over compression even when cold. There seems no remaining point at which compression can possibly escape, and so they jump to the faulty conclusion that new piston rings are necessary, or that the cylinder has worn. The real truth is that the compression escapes through the cylinder head into the water jacket, in some makes of engines. If the nut on the top of the cylinder be removed, and the cover lifted off the water jacket, it will be seen that the head of the cylinder is screwed on, and not integral with the casting. Two holes are set in the top of this cap, designed to take a key or punch, by which it may be unscrewed and lifted out. It will then be found that the fibre washer which safeguards the joint has perished through heat, and if this be renewed and the cap tightly screwed back into place the compression will instantly resume its pristine vigor. The opportunity may be taken to clean the tops of the pistons from any accumulated deposit.

A Loose Steering Gear.

Too much play in the steering gear should be corrected, although a little looseness need not be minded. In fact, a new car very soon shows a certain amount of looseness in the steering, but it seems to reach a certain stage and remain there, and the owner having gradually got accustomed to the slackness does not trouble to rectify it. But the more you tighten the worm, the faster it wears, so it is often policy to leave well alone, so that in overhauling a second-hand car a certain amount of slackness need not be taken seriously. The play in the coupling joints can be distinguished from that due to the worm gear by watching the joints when the wheel is moved. If leather covers are fitted to these joints, they should be taken off, so that the joints are exposed.

When putting a car in commission, and occasionally, say every month or two, the interval depending on the amount of use the car is given, the hub caps should be thoroughly cleaned out, all the grease and verdigris removed, after which the caps should be repacked. It also is well to clean out the hubs and bearings, washing them thoroughly with gasoline so that dirt and grit will be dislodged.

TROUBLE DEPARTMENT.

Under this head are questions and when possible, replies to them. Our readers will appreciate the importance to inquirers of furnishing the desired information promptly.

This department is intended to be a "trouble clearing house," and it will be esteemed a favor if our readers will add information to it from their own experience or knowledge.

Three Queries.

From R. R., Illinois.—1. Is there any other advantage in using hot air (from around exhaust pipe) than that it makes a better gas?

2. What causes the vibrator to stick when a coil has been working for about ten minutes? How can it be remedied?

3. What are the indications of a weak mixture on a four-cycle gasoline engine?

Reply.—1. Usually the use of warm air is to assist in the vaporizing of the gasoline in cold weather. Aside from this, it is really a disadvantage, as the warm air expands and a given volume of the warm mixture contains less heat units than the same volume of a colder mixture.

2. Probably the vibrator points are pitted, especially if the coil is not a new one. If the points are not worn down too much, you can file them off smooth. Otherwise they would have to be renewed.

3. Usually misfiring followed after one or two missed ignitions by an impulse, and then an explosion in the muffler. The weak charges fail to ignite and exhaust unburned. The portion remaining in the combustion space enriches following charges, and then the charge ignites and its exhaust fires the previously exhausted unburned charges.

Getting Rid of the Pounding.

From D. S. Taylor, California.—Replying to a query from George Denio, New York, in the June number about the pounding in his model M Cadillac, will say that I had the same trouble. I found no loose bearings or carbonized cylinder, and the engine was timed perfect, so I made the time slower by two cogs of the time gear and overcame all the pounding, and am getting fine results. Imperfect lubrication of the cylinder will cause pounding, as the oiling device is located on one side of the cylinder, and the left side of the cylinder, when the engine gets hot under a load, will get partially dry. By putting a tablespoonful of graphite, mixed with a pint of heavy oil, in the crank case before every long trip all sticking will be overcome.

He Uses Solid Tires.

From William Brown, New Jersey.—I have two St. John tires on my Knox car for the rear wheels, and they ride as easy as pneumatics which I used before I put them on. Some people said I would ruin my car, but I cannot see any difference in the riding. They do not jar the car any more than the wind bladders did. Before I used the solid tires I had nothing but trouble. They are all right if you do not run over twenty miles an hour on good roads, and that is fast enough for safety and pleasure. I will put them on the front wheels soon.

(Note.—This is no doubt true, as far as the riding is concerned. Quite likely there is a slight difference in the amount of gasoline used, however, the hard tire being slightly heavier, and requiring more power for propulsion. But this is hardly appreciable, and we think that for the speed our correspondent refers to, hard tires will finally come into more general use, for the reasons he gives, that of far less cost of maintenance.—Editor.)

Uses Too Much Gasoline.

From W. E. G., New York.—I am the owner of a 12 h. p. four-cylinder car and find that the carbureter is not satisfactory. The car has a top and a glass screen. Sometimes, having started the engine and raced it a little to warm up, the engine will stop. On inspecting the carbureter I find it absolutely dry. When it is flooded again the engine starts quite easily. But as I cannot get more than 12 miles per hour on a gallon of gasoline there seems to be something wrong. Can you make any suggestions?

Reply—The question of the number of miles to a gallon of gasoline depends so much upon other considerations than the engine or the car that we should not like to hazard an opinion from the data you have given us. Loads, roads and grades have much to do with the matter. When you say that the carbureter is dry after the engine has stopped, do you mean the jet or the float chamber? Of course, if the float chamber is dry and empty, gasoline is not running into it as it should. On the other hand, if you are using too little air or too large a jet, you will get irregular running and high consumption of gas.

Force Feed Lubricator.

From W. F. Gerdes, Nebraska.—I would like to have your advice in regard to my Pope-Toledo 35-horsepower car. My trouble has been in the force feed lubricator. The oil seems to drop all right and fill the sight glass, and sometimes the oil leaves it all at once. If the cylinder is the cause of this, I don't know. My car is a Pope-Toledo 4-cylinder car.

Reply.—The reason the oil fills the glass and leaves it all of a sudden is because the air vents are stopped up. If you will clean the air vents on your sight feed oiler you will find the oil will not fill the glass and will drop all right if properly adjusted.

The Pounding Cadillac.

From J. E. B. Wright, Texas.—In the June number of The Automobile Dealer and Repairer, in the "Trouble Department," I notice the article from George Denio, New York, about a pounding Cadillac. I think I can tell him where his trouble is. Disconnect the connecting rod from the crank, take hold of the connecting rod with both hands and work the piston up and down and see if there is not a whole lot of play between the piston and cylinder walls due to improper lubrication. The piston should fit perfectly, and any play at all will cause a bad knock. If this is the cause of his trouble the only cure is a new piston cylinder and set of rings. Would ask to hear from him if this is his trouble.

A Queer Radiator.

From Louis Cohen, Ohio.—Some time ago I overhauled my car, a Packard, model F, 1903, and after assembling the same I could not get the water to circulate. I flushed the entire cooling system over and over again, using washing soda and sometimes kerosene, but without results.

My repair man advised buying a new pump, which is of the gear type. As he explained, "the cogs were worn and did not throw the water with enough force." I was about to order one from the factory, when one day I started on a short errand, at the end of which I felt of the radiator and found it quite warm, which, of course, indicated circulation. I then happened to think that I forgot to fill the water tank before starting. I looked into the tank and found it a little over half full; a slight leak in the radiator was the cause of it. When I re-

turned I filled the tank to the overflow and got no circulation. After several experiments I found that by filling the tank full the water would not circulate, but by filling it up to about two inches of the overflow the circulation was perfect.

I do not know the cause of this queer prank, and am not worrying much. All I have to do is to be careful not to fill the tank too full and go about my business.

For the Pounding Cadillac.

Lewis Slama, Nebraska.—I see in your last number, in the Trouble Department, George Denio, of New York, has trouble with a Cadillac pounding. I had that same trouble. I tried everything, but still it would pound when pulling, but would run nicely when standing still. I finally discovered by uncovering the crank case and turning the engine over that the piston leaked badly just as it started forward on the power stroke, but would leak very little on the compression stroke. I took off the cylinder and found the piston, rings and cylinder badly worn. I then ordered a new cylinder, piston and rings and now the engine runs like new. The expense was less than $20, including express charges.

Never Oil a Coil.

From Heuston Mahony, New Jersey.—Please tell me whether you oil a National coil for No. 2 cylinder? If so, where and how often? Also the correct amount of air pressure in front and back tires of a 1,900-pound touring car for four or five persons.

Reply.—You never oil a coil of any kind. In regard to the amount of air pressure in tires it depends upon the size of the tire. For example, a tire 30x3½ will stand from 65 to 70 pounds pressure. If you will state the size of your tire, we will tell you the required pressure in the next issue.

Engine Knocking.

Sometimes the engine pounds on opening the throttle beyond a certain point. The true cause in practically every case will be found to be fouled cylinders and carburation too rich. The carbureter requires attention from time to times, as, however finely set at first, continued running will always be tending to spoil the adjustment of the needle valve, causing occasional flooding at the jet when the throttle is opened up. In a perfectly clean cylinder the result would be only a marked falling off in power; on full throttle the engine may even pull up altogether. When the cylinder is in a fouled condition, and the top of the piston has a deposit of carbon from 1-16th to ⅛th thick in a state of incandescence, pre-ignition inevitably results. There are other factors helping towards this, such as the increased compression on the greater volume of gas and the slow burning gas remaining in the exhaust ports from incomplete combustion.

Care in Using Planetary Gears.

An experienced driver advises that much care be used in driving cars with planetary change gears, in spite of the generally accepted belief that less skill is required than with those of the sliding pinion type. It is difficult to know the point at which to shift from the low gear to the direct drive. If the low gear is used too long the grinding of the gear will indicate the heavy load on the very small parts, which are likely to be worn rapidly. If the high gear is applied before sufficient momentum has been attained, on the other hand, the sudden strain on the engine is likely to have serious effects.

Care of the Horn Bulb.

To get good wear out of the horn bulb, take care of it as soon as a defect appears. Most of them have a raised ring in the middle of the bulb just where the thumb of the driver comes, and very soon at this spot the rubber gives way. The bulb can be mended quite well with a solutioned patch, but this is apt to give way from time to time. The best method is to deal with the bulb before it begins to leak. The first thing to do is to fill up the space inside the raised ring with a solutioned disc of rubber. Then solution another ring of rubber round the raised ring, about half an inch wide, and on top of this place still another piece of rubber. If this work is carefully done, it results in the part of the bulb, which is most subjected to wear, being greatly strengthened, and they will last for a couple of years without renewal. The operation may be simplified by paring the ridge away with a sharp knife until flush with the bulb, then placing a large patch right over the top of the entire bulb. There is no better material for the purpose than an old inner tube.

Clean the Engine.

A complete clear-out of old lubricant will sometimes change a sluggish engine and car into a lively and responsive one. Some manufacturers give explicit instructions on this point, but the majority do not. The test for a change in this way is simple. When the engine is going well it can take certain hills at a certain speed on top with open throttle, starting, say, at 25 and dropping to 20 by the speedometer. If suspected of sluggishness the car is set at one of these, and if its behavior is not quite satisfactory, we assume that it is time to clear out the base chamber, with unfailingly good results. In small cars once a week is a good plan if they are in use every day. In cars with positive feed lubrication the exhaust will come smoky if the lubricant is old and carbonized by the cylinder heat. Proper lubrication and lubricant ensures immunity from fouled cylinders and plugs and a hundred minor annoyances.

Washing the Car.

Use plenty of water. Two sponges should be used and two chamois skins, one set being used for the body and the other set for the chassis and running gear, since the chassis and running gear will always be more or less oily, and there is no excuse for getting oil on the body. When a car comes in at night covered with mud, under no circumstances should this be allowed to remain on over night and harden. The car should be immediately run on the washstand and the mud softened by showering the car with cold water. Do not attempt to rub the mud off, but allow it to be taken off gradually by the water. There are many excellent soaps on the market, but castile is probably as good as any.

Too Close to the Curb.

If a car is driven too close to a high curb the running-board and fenders may be damaged and the hubs of the wheels may also be injured. It is not always easy for a driver to judge, from his seat, the height of the curb, as compared with the clearance of his running-board and fenders, so it is well to maintain a safe distance. Even if the curb is a low one and there is plenty of clearance for the running-board, there will be trouble in getting away if the car is run too close, for the possible deflection of the front wheels will be found very limited when an attempt is made to turn away from the sidewalk, and paint and rubber will not last long when forcibly scraped along a rough stone surface.

The Test of Smoking.

A great many motorists who have cars fitted with drip feed lubrication rely upon the emission of smoke as a proof that the engine is sufficiently lubricated. This rough and ready test is really not much use for four-cylinder engines unless the smoke is very carefully observed, because the majority of them have the crank case divided into two portions. One half may be over-filled and the other insufficiently filled, so that there will be plenty of smoke, but one half of the engine may be more or less dry. Of course, it depends upon the type of lubricator used, and also whether the division between the crank cases is complete or only partial; but there are a number of cars made which have entirely separated crank cases—two cranks dipping into one and two dipping into the other. These are usually fed by separate drip feed lubricators. The other sight feed either oils the central bearing or is branched away into four separate branches to lubricate the cylinder walls. Now it will be seen at once that if, say, the right-hand lubricator over-feeds into the back crank case and the left-hand one under-feeds into the front crank case different oil levels will result. The engine will smoke from the two back cylinders, and the car driver will think he has got plenty of oil in his engine, though really the two front cylinders may be starved. It is true that on the majority of cars there is no way of ascertaining what the oil level really is, as there are no level cocks nor instantly removable inspection lids to the crank case, and therefore the only thing to do is to watch the emission of smoke very carefully. When one starts up the engine before leaving the garage, he should watch the exhaust pipe very carefully. It will be found that if one crank case is overfilled the smoke will come irregularly, but if both are filled to smoke level it will appear in a continuous stream. This is the only test available except that of cutting out the plugs of the cylinders in pairs, and the only safe remedy is to see to it that the sight feeds always drip regularly, and that if one of them becomes blocked, so that the oil does not run out of the glass, a stop should be made at once and the pipe cleared. Many drivers of cars are apt to think that if two out of three lubricators are feeding plentifully it is all right, but it is a vital matter, and may result in a seized cylinder, a ruined bearing, or a scored cylinder wall.

A Gasoline Supply.

Many motorists like to carry a spare can of gasoline in the car, so that in the event of a bad miscalculation of distance or a broken gasoline pipe they can have some fuel to fall back upon. It is always a good plan to change the spare tin for a new one every month or so in case the spare should happen to be a slightly leaky can. We have found the most convenient way to carry it is in a box specially made for the purpose under the footboards of the back seats. If it does not fit the box tightly it should be packed firmly with some rags or cotton waste, so that it cannot move about in the box. Another good plan for carrying it if the car has a very high back seat is to have a box made for it in the form of a footstool. On small two-seated cars there is no need to carry a two gallon can. In fact, there is not often room for it, and the steps are not wide enough to take it comfortably. One careful owner of a small two-seater has adopted the excellent plan of fitting a box upon the right hand step which is just large enough to take a special one gallon can which he has had made for him. This can is really a tank, as it is made of sheet steel, and it is an altogether better thing than the ordinary gasoline tin. In the comparatively small running tank of a two-seated car a gallon is at least equal to two in the tank of a larger car, and is, therefore, quite enough to carry as a standby.

Stranded Without Gasoline.

Quite a number of cars have badly designed joints at the point where the feed pipe enters the bottom of the tank, and when the driver is handling a strange car and testing his supply of fuel by eye through the filling orifice he may be tricked into getting stranded without gasoline, if the joint be not flush with the tank bottom. This has often befallen car drivers recently. In one instance the car stopped late at night seven miles from its destination, and yet there were nearly two inches of gasoline in the tank. In this case the joint had leaked, and had been remade by a thoughtless mechanic, so that the bottom two inches of fuel could never find their way to the carbureter. The emergency being serious, there was no choice but to drop many small pebbles into the tank, on the lines of Aesop's fable, until the gasoline was brought above the projecting lip of the feed pipe. The remedy proved expensive, as on detaching the tank and attempting to remove the stones by shaking them out of the filling orifice it was found that the filler also had an internally projecting lip, and consequently the tank had to be cut open to get rid of the pebbles. Remembering this experience as a sad warning, it was noticed in another emergency that the feed pipe joined the tank at one corner, and not amidships. Consequently all the passengers were set to jump on the springs on that side of the car, so that the tank was tilted, and enough gasoline ran into the pipe to fill the carbureter and pipe. The engine was then started, and the car would run for three to four hundred yards until the supply thus obtained was exhausted. The process was then repeated, but just when all concerned were getting heartily sick of it, some one brought a can of gasoline from the nearest store.

A Small Saving.

Turn off the gasoline from the carburetter each time the car is put back into the garage for the night. If the needle valve is all right and the carburetter is well assembled, there is no fear of gasoline leaking, but many needle valves do their work for the engine perfectly, yet leak when the car is idle. The danger arising from this is that somebody lighting a cigarette may throw away a lighted match and a conflagration sometimes has arisen when the smoker thought that he had taken every precaution.

Loose Spring Clips.

It is a good plan occasionally to see that the nuts of the clips holding the springs of a car in position are tight. Loose spring clips are the cause of many broken springs, for they allow more stress to be thrown on the center of the leaves than there should be. If the clips are perfectly tight the portion of the spring between them is practically a solid piece, but if one of the clips is loose there is much more individual movement among the leaves.

Care of the Chain.

In chain driven cars the chain should be cleaned often, depending upon the weather and the amount of use, of course. Never oil the links when the chain is on the car; it does more harm than good. If the chain is very dirty, give it a bath in kerosene oil, working all the dirt and grit out, and then use graphite. This does its work in a dry state and if well worked into the links little or no dust can get inside the rollers.

Words of Praise.

From Louis Cohen, Cleveland, Ohio.—I have learned much from your publication and am always eager for the next number.

A BIG RUBBER TIRE BUSINESS.

Eight years is the short period of time, but it was long enough for the Firestone Tire and Rubber Company to grow from nothing to its present enormous size. When the business was started, August 1, 1900, a small one-story structure was the extent of the plant. The demand for Firestone tires increased so rapidly that additions were repeatedly made necessary, until to-day it is the largest factory in America devoted exclusively to the manufacture of rubber tires.

Mr. H. S. Firestone, president of the company, when asked the reason for this remarkable growth, said: "I attribute our success to our early recognition of the value of the highest quality of materials in rubber tires. At the start we adopted the policy of making tires only of the highest grade and never have we even been tempted to decrease the quality by the use of cheaper material. An additional reason is the concentration of our efforts toward the betterment of rubber tires in general and Firestone's tires in particular. We have worked longer on one idea that would improve tires generally than some manufacturers would spend to improve their own individual product only."

In the present large factory are installed only the latest and most modern machinery for the manufacture of rubber tires. Every convenience and improvement for the making of perfect tires is there. The attention of the company was first directed to the manufacture of solid tires for automobile trucks, and they were among the first firms to manufacture successful tires for vehicles of this class. The remarkable success achieved in the manufacture of solid tires was so gratifying that they decided to enter the pneumatic field. During the years that they have made pneumatic tires they exercised the same care and high purpose as when they made only solid tires.

The Firestone Tire and Rubber Company are called "The Rubber Tire Specialists." This is due to the fact that their entire and undivided attention is given to the manufacture of rubber tires, that being their exclusive product. They carefully study the requirements of a good tire for vehicles of all descriptions, under varying circumstances. Their careful study and the concentration of their thoughts and efforts on the tire subject make them rubber tire experts of a high reputation.

It is the company's boast that they can properly equip any vehicle with any tires, from the lightest carriage to the heaviest truck. A continuation of their policy to make every tire as good as possible in both construction and quality cannot fail to bring continued success to the Firestone Company.

AUTO TOPS.—In this issue will be found the announcement of the Auto Top Company, 209 East Columbia street, Fort Wayne, Ind. They want our readers interested in tops to get their prices before ordering.. Write to them and mention the AUTOMOBILE DEALER AND REPAIRER.

For Painting Mufflers and Pipes.

Use the following compound: Boiled linseed oil, 1-5 pound; Japan varnish, 1-5 pound; spirits of turpentine, 2-5 pound; lamp black, 1½ ounces; pure powdered graphite, 1½ ounces; powdered oxide of manganese, ⅜ of an ounce. The Japan varnish and linseed oil should be first mixed together, then add in the order named and stirring all the time the lamp black, the graphite and the manganese. The solids must be added slowly while the mixture is being stirred briskly. The mixture should be thinned down with the turpentine as it thickens. The paint must be applied at once, as it dries fast, and stirred every time before the brush is dipped. The muffler ought to be thoroughly cleaned and painted while hot.

Loss of Compression.

One cause for loss of compression in a motor is the settlement of any dirt or foreign matter in the seat of either the inlet or exhaust valves, the latter being the more prone to this trouble. Bits of carbonized oil very often fall on the seat of the exhaust valve and are pounded into the metal, causing the valve and vavle seat to "pit." They, of course, do not fit closely after this, and the compression is forced out between them as a consequence. In a case of this kind it is necessary to remove the valves and grind them in.

Draining the Undercasing.

There is great danger in allowing accumulation of gasoline or oil in the undercasing or shield of the car. If there are large drain or scupper holes there will never be any accumulation of grease or oil. There is no great danger in such an accumulation, but the danger is in the leakage of gasoline. If the carbureter floods or gasoline by any means runs into the undershield it cannot run out, and if the gasoline catches fire there is the accumulation of oil and grease to feed the flames. However, the point is this, that if there are drain holes the grease cannot collect, and any gasoline which escapes will instantly run out. The absence of such scuppers has resulted in the total destruction by fire of several cars. If the undershields had been well drained there would only have been a small fire, which would have been very easily stopped and quite short lived—nothing more than could be smothered with a rug.

Gasoline of Different Grades.

Carbureters in which adjustment is provided for the amount of gasoline supplied to the jet very often require readjustment when a different grade of gasoline is used. This should be carefully noted, as frequently erratic running arising on this account has been wrongly attributed to other causes.

A NEW GASOLINE TORCH.

Illustrated herewith is a small gasoline torch known as the Imp Torch, which, it is claimed, is extremely useful as well as economical for soldering and heating. In order to light the torch hold a match under the neck for about thirty seconds. It is simple in construction and operation. No air pump is needed. The flame produced

The Imp Gasoline Torch.

shows complete combustion and burns with a clean flame of intense heat. It is used by electricians, telephone linemen, painters, repair men, automobilists, and the man who does his own repairing. Weight, 3½ oz. Burns two hours. For further information address the Frank Mossburg Company, Attleboro, Mass.

Automobile Tops.—In this issue Buob & Scheu, 1444 Court street, Cincinnati, Ohio, come before our readers with an announcement of their automobile tops, which they sell at prices ranging from $14 upward. If you want to know about their tops send for their catalogue and prices, which will be found to be extremely attractive.

A STORY OF PROGRESS.

The Middle West is a progressive country and Chicago is a great automobile center. These facts are well demonstrated by the business history of the Chicago Vulcanizing Company. This business was founded October 1, 1905, and at that time occupied quarters that cost $15 per month for rental. January 1, 1906, a new store was taken where the rent was $35 per month. On January 1, 1907, a large double store was taken at $90 per month, and in two years the business had developed from nothing to $15,000 per month. The Chicago Vulcanizing Company is now moving to the finest location in the famous "Automobile Row," on Michigan Boulevard. The new quarters, Nos. 1400-1402 Michigan Boulevard, consist of two stories and basement, with 50 feet of frontage. The location is that heretofore occupied by the Chicago Battery Company, who make the "Duro" line of electrical specialties. The Chicago Vulcanizing Company will still make tire business and tire repairs their principal specialty, but in addition will represent the "Duro" line, as special agents. They will also carry a large line of staple auto accessories, most of which they control. The establishment will be open nights and Sundays for the convenience of thousands of auto-owners in Chicago. A large mail order business is carried on, in addition to local retail trade. Our readers may be sure of prompt and faithful service by patronizing this company. Consult the advertisement, send your orders to the Chicago Vulcanizing Company, 1400-1402 Michigan avenue, and mention the Automobile Dealer and Repairer.

The Firestone Tire and Rubber Company has brought out a handsome and artistic book devoted to the subject of side-wire tires and their use on motor-driven trucks and fire apparatus. The printing and illustrations are a pleasure to the eye. The purpose of the book seems to be to present concrete evidence and testimony as to the satisfaction the Firestone tire gives to all kinds of these vehicles, and the evidence seems conclusive. Those who are thinking of purchasing any kind of a motor truck will find about all kinds shown in this work, and by the best possible half-tone cuts.

"C" Type Motor.—In this issue the Holt Electric Company, manufacturers of dynamos and motors, 285 Virginia street, Milwaukee, Wis., have an attractice announcement. They make a specialty of rebuilding dynamos and motors and invite correspondence. In writing to them, mention the Automobile Dealer and Repairer.

The Brock Carburetor.—This device involves a new idea, old methods being reversed. He wants to tell all our readers about it. Write for circular to A. A. Brock, 86 La Salle street, Chicago, Ill., and mention the Automobile Dealer and Repairer.

Lathes for Automobile Shops.—The Rockford Drilling Machine Company, Rockford, Ill., make a specialty of lathes for automobile repair work. Their lathes are in use in all parts of the country. Send for their catalogue and prices and mention the Automobile Dealer and Repairer.

Gas Tanks.—The Avery Lighting Company, Milwaukee, Wis., and 51 West Sixty-third street, New York, have an announcement in this issue which will interest many readers no doubt. They say that the "Autogas" tanks give one-third more gas and light than any other. Write to them for further particulars and mention the Automobile Dealer and Repairer.

WANT ADVERTISEMENTS.

Under this head will be printed advertisements of shops for sale or to rent, or shops wanted, or situations or help wanted, or tools or machines (second-hand) wanted or to exchange, at the uniform price of two cents a word, which will include the address, for each insertion, payable in advance. No advertisement will be inserted for less than 30 cents, however small.

Remittances can be made in postage stamps if more convenient. Address,

MOTOR VEHICLE PUBLISHING CO.,
24 MURRAY STREET, NEW YORK.

FOR SALE—TWO LIGHT MOTORCYCLES, 105 pounds; in perfect running condition, fitted for 160-lb. riders; $110 for chain drive Indian, very little used. Wood rims, new Fisk tire. The best Thor motor; was made for this model. Climb any road; $60 for belt drive Wagner, wood rims. Fisk tires. Indian carburetor, valves and commutator, N. S. U. belt and pulley, easiest riding machine. Cash only; no demonstration. Address F. A. Roy, 527 Fifth Ave., New York City.

WILL EXCHANGE ONE OR FOUR lots in Velasco, Texas, at mouth of Brazos river, the coming deep water port of Texas (cost me $1,200 each) for a second-hand auto costing same when new; not older model than 1906. Tom Childress, Arlington, Texas, R. F. D. No. 2.

"HOW TO CURE CARBURETER TROUBLES"—valuable advice from one who knows. Send six cents postage for free 36-page text-book. "Carbureters and Engine Troubles." Breeze Carbureters, Newark, New Jersey.

CADILLAC—Model M touring car, fully equipped, with top, gas lamps, etc.; in A-1 condition; perfect engine and new tires; cost $1,100 new; will sell at bargain for cash. Address P. O. Box 857, Watkins, N. Y.

RUNABOUT SNAP—First check $550 takes my new 1908 model four-cylinder "Cameron" runabout; like new; has run 500 miles. Be quick. It's a bargain. Address Box 305 Millbrook, N. Y.

A LEATHER FOLDING TOP FOR RUNabout. Also a Veeder Odometer. Both practically brand new. Will sell very cheap. 1415 Catharine St., Philadelphia, Pa.

17 CARS MUST GO REGARDLESS OF cost. Runabouts to 4-cylinder 30 h. p. $3,000 cars $100 to $850. Write for bargain sheet and save money. T. S. Culp Exchange, Canton, Ohio.

20 H. P. TOURING CAR—Perfect condition, top, two new tires, $450. Hart, 147 Main Ave., Passaic, N. J.

FOR SALE—$400.00—SECOND HAND Marion 5-passenger touring car; 4-cylinder, 25 H. P. A good chance while it lasts. C. H. Conley, Newport, Ind.

BARGAINS—1907 Gale Roadster, with Rumble Seat, cheap; four-cylinder Ford Runabout cheap. Address Box 275, Burlington, Wis.

FOR SALE—Two-cylinder Olds, Winton and Stevens-Duryea; one-cylinder Cadillac, Olds and Pope-Tribune; also one and two cylinder auto buggies. Address F. W. Fisher, Sedalia, Mo.

CORRESPONDENCE with auto manufacturing company with good shop facilities, desiring to take up auto suited to country roads; specially adapted for rural delivery. E. P. Cowles, Warren, Ohio.

FOR SALE—300 sets, 28x3, best grade artillery wheels, fitted with clincher rims, less hubs. Write for bargain prices on single sets or the lot. Address Thos. B. Jeffery & Co., Kenosha, Wis.

AUTO TIRES REPAIRED—Tires repaired by experts and guaranteed; low in price; square deal to all. Lafayette Auto Tire Co., 513 North 9th st., Lafayette, Ind.

FOR SALE—Two-cylinder five-passenger touring car; looks like new; complete equipment. Lafayette Auto Tire Co., 513 North 9th st., Lafayette, Ind.

BROKEN CASTINGS WELDED. Any wheel. Guaranteed like new. "Futterman Welding System," New York Coach & Auto Lamp Co., 798 10th avenue, New York city.

FOR SALE—Winton 1907 Model M, top and dust cover, TIRE holders, tire case, extra tire, folding glass, front, gas tank, two extra seats in tonneau, Kilgore shock absorbers, speedometer; cost new $4,200; will sell for $2,000 and guarantee it in first-class condition. C. C. Stotz, Marion, Ohio.

FOR SALE—2-cylinder 2-cycle 10 horse power engine; new piston and rings, make and break ignition grease and oil cups; price $50. Central Supply Company, Richland, Pa.

CHAUFFEURS, machinists and repairmen can secure free a set of Bullard wrenches. Write us for special offer. Bullard Automatic Wrench Co., Providence, R. I.

FOR SALE—Steam Automobiles; write for illustrated bargain list. F. W. Ofeldt & Sons, Nyack, N. Y.

SOLICITORS WANTED.

WE WANT MEN in all parts of the country to solicit subscriptions for the AUTOMOBILE DEALER AND REPAIRER, and are prepared to offer extremely liberal terms. For particulars address the Motor Vehicle Publishing Co., 24 Murray street, New York.

TIRES RECOVERED, 12.00 up, according to size. Non-skid, leather, rivet shod tread, $15.00 up. All kinds repairs done promptly and reasonably. Very best material and workmanship. All recovers guaranteed 2,000 miles. Good second-hand tires $10.00. New York Steam Rubber Tire Repair Works, 306 West 52d st., New York City.

FORD RUNABOUT OWNERS—Modernize your car with Rumble seat and trunk, $15. Glass front, $12; 3-hinged folding hood, $8; roadster fenders with brass bound running board, $12. Discount to dealers. State your wants for catalogue. Auto Rebuilding Co., Chicago, Ill.

MODEL A CADILLAC—Removable tonneau, with deck, new tires, lamps, generator, etc.; car in perfect running order; make me offer; write at once. Jos. T. Levanduski, P. O. Box 45, Rockfall, Conn.

FOR SALE—Beautiful new 50 horse power, seven-passenger Pope-Toledo Model "U" 15 touring car, finished in coral red. Patent leather upholstering, beautiful cape top, 10-in. Rushmore headlights. Will take for part pay any good standard runabout. Robert Holmes & Bros., Danville, Ill.

FOR SALE—Renew Old Dry Batteries; tested recipes for renewing sent for 25c. Roy Graham, Stockton, Kansas.

REBUILD YOUR CAR into "Gentleman's Roadster." We make latest style hoods, radiators, tanks, fenders, "hood dashes," glass fronts, auto trunks, Rumble seats, etc.; 20% saved. Your old car re-designed free. Hood and Dash outfits for '08 and '04 Ford, Cadillac and Winton in stock. Smashed lamps and radiators repaired like new. State your needs for catalogue. Auto Rebuilding Co., Chicago, Ill.

CHAUFFEURS, automobile salesmen, mechanics, repair and garage men furnished without charge; only experienced and reliable men, no school students unless wanted; all are guaranteed and bonded by Automobile Sales Corporation, 1661 Broadway, New York.

SOME SNAPS—1908 searchlights and generators, samples used for show purposes only, direct at half price, while they last. Miller Mfg. Co., Peekskill, N. Y., Dept. D.

FOR SALE—ALUMINUM CAN BE SOLdered successfully by using Aluminum Solder and Flux. Sold by E. F. Lester Co., Fayetteville, N. Y. Write for booklet.

Classified Buyers' Guide.

Index to Advertisers.

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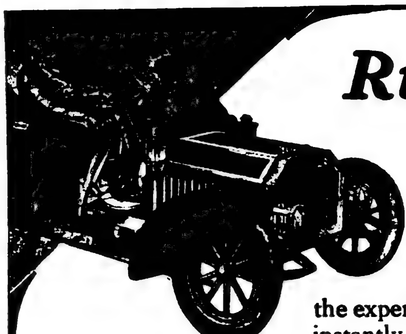

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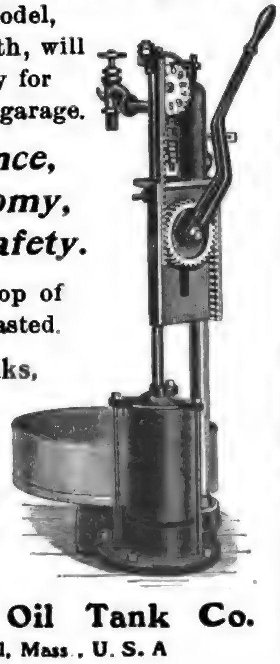

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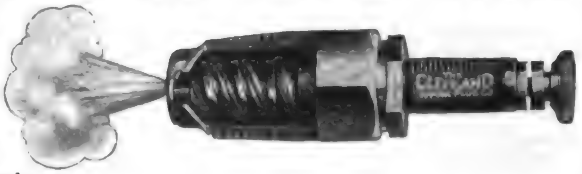

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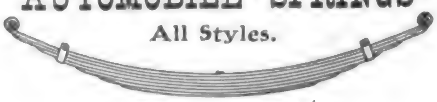

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VOL. V., NO. 6. NEW YORK, AUGUST, 1908. PRICE { 10c. PER COPY / $1.00 PER YEAR

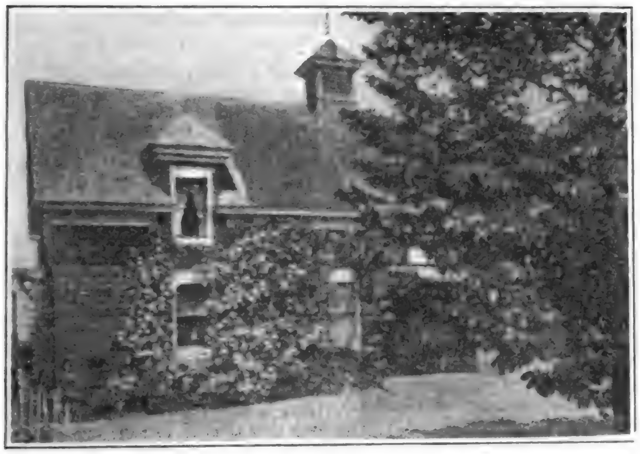
ARTISTIC GARAGES.

Fine Examples of Decorative Construction Near New York.

In many cases architects have induced clients to realize that an intimate relation exists between garage and dwelling house. An Italian villa and a garage built upon the plan of an Arkansas barn do not harmonize. Frequently owners of motor stables made this deduction for themselves.

GARAGE ON A TERRACE.

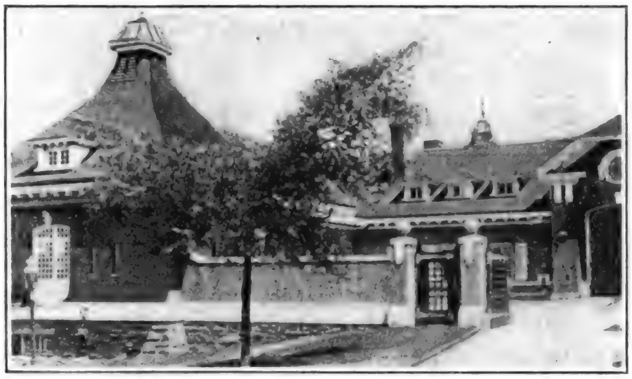
Instead of existing merely as a place in which to house automobiles, the garage has become a thing of beauty, carrying out in its construction the plan of the building or buildings to which it belongs. It occupies an harmonious place in the scheme of the landscape and partakes of many of its elements.



GARAGE AND RESIDENCE FOR THE CHAUFFEUR.

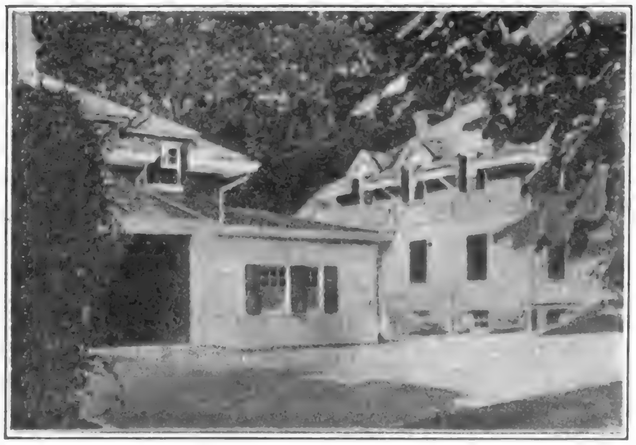
Sometimes it assumes the appearance of a Moorish building, with vine-hung porticos and picturesque Spanish windows; often it is a stone lodge, with small, high latticed windows that sometimes belong to the chauffeur's rooms above the garage. Again, a flower draped summer house proclaims only by its high foundations that it really surmounts a motor stable.

A cloister is sometimes suggested by an old English masonry design covered with vines, and one, peeping in to surprise a monk at orisons, is met by a glitter of automobiles, the hood of a motor car in place of a capuchin and the odor of oils instead of incense.



AN ARTISTIC PRIVATE GARAGE IN NEW YORK CITY

A touch of church architecture is often given these buildings to the extent of stained glass windows. If architects place garages with reference to residences the plan of the dwelling house is carried out, so that they may appear a detached continuation of the residence, repeating its minor details and conforming in material, style and color to the dominant feature of the landscape.



PRIVATE GARAGE JUST ADDED TO A HOUSE.

But architectural harmony is not the only feature now considered in the placing of a garage. It is situated where it will fit best into the landscape rather than where the motor may most conveniently be run into it. Where the structure forms part of a large estate, pergolas often serve to connect it with greenhouse or conservatory, or act as a screen to conceal the major part of the building, which, in such a case, is wall-like in exterior finish. Some-

times where the garage enters into a garden or terrace effect, it is built in low, irregular style, veiled with vines and screened with shrubbery and trees. Amid the foliage quaint roofs and mayhap, red tiling add a color note and contrast of form that are pleasing.

Stucco and stone or monolithic concrete are favorite materials of which to construct modern garages. These substances are fireproof, a quality sought where electric sparks and inflammable oils are in constant use. Often they are combined with highly artistic result, as cobble, field and building stone with concrete, brick or stucco.

Taste may be used in the placing as well as in the building of a garage, but if the residence is of wood and colonial style, the garage is often in harmony. Where a house is shingled automobiles are sheltered within a shingled domain. The best tastes are offended at the sight of a wooden mansion flanked by a stone or cement garage unless the latter is cleverly worked into the wall plan or screened amid garden foliage and vines.

The inexpensive garage, of material differing from that of the house, is made beautiful by trellises covered with flowering runners. Many a garage entrance opens between arches of roses, which form a rich embroidery over the entire face of the building. The garage is as much indicative of the taste or means of its owner as the vehicles which it houses.

The illustrations show several garages of particularly artistic design. Of course, few are able to own anything so expensive or elaborate, but the ideas in a modified form will prove useful to prospective builders.

Among the Clouds.

Thousands of tourists who annually visit California have a great desire to ascend Mount Hamilton and see the sights at the world-famous Lick Observatory. It has always meant an exceedingly long, tedious trip, as no

ordinary locomotive could make the climb. Heretofore a stage was the common method by which tourists reached the top.

But John H. McGehee, of Letcher's Garage, San Jose, Cal., is an aggressive motorist. He figured that an automobile stage would be the thing. He investigated considerably for a car which was capable of doing the work. The friction driven Carter car was finally selected as best designed to perform the difficult task of constantly "climbing" or "braking."

The accompanying picture shows the car at its daily work. The road has an elevation of 2,100 feet in a distance of seven miles. The view was made in July, but the perpetual snow will be noticed upon the ground and shrubbery.

SECOND-HAND CARS.

Before Buying, a Whole Lot of Knowledge Must Be Had.

A man who wants to buy a car cheap may, by nosing around, pick up a bargain in a second-hand car, but before he tries to do this he should know the game thoroughly. There are no rules that can be laid down, as second-hand cars are like horses—their value is a matter that does not depend on the one who wants to sell. A man sells a reasonably new car in most cases for one of three reasons, either because the car is used up, or because he needs the money, or because he's getting another car. There may be a bargain for somebody. But there is never any way to tell. Another case is made up of the demonstrating cars which may sometimes be picked up at the garages at the end of the season, but these are of necessity limited in number.

There is one phase of the matter that can be spoken of with a good deal of assurance and that is the practice which has sprung up of coming to New York to buy the cars of bankrupt millionaires for a pittance. It is merely another version of the bunco game. In the early fall, without doubt, some automobile bargains were had in New York city, but they were not for outsiders. If you must buy a second-hand car go to your own dealer, whom you know, and whom you can get hold of afterwards, and buy the car through him. But when a man from a fairly distant city comes to New York to buy a second-hand car from a stranger he becomes an easy mark. A local dealer is responsible, but a stranger in this city would be reasoning very queerly if he thought that he could get any hold on a New York garage which sells second-hand cars. This New York game of the old car business is but a revival of one that was worked formerly in the bicycle business. A house would advertise some wonderful bargain in a slightly used wheel. When an application was made to see that particular wheel it had always been sold, but there were lots of others with which to entertain the visitor. The main thing was to get him there.

Is Your Tire Casing Thread Exposed?

As soon as the tread wears down until the fabric is exposed a tire casing should be removed and sent to the manufacturer to be retreaded. Otherwise the fabric will soon be destroyed and the tire permanently injured in consequence. When imbedded in rubber and not subjected to strain or weakened by bending the fabric used to reenforce a tire casing will retain its strength indefinitely. As soon, however, as the rubber is removed and moisture from the road is allowed to penetrate into it the fabric begins to disintegrate and in a very short time its strength and resistance are gone.

Painting the Brass Work.

To paint the brass work of a car it is best to first rub the metal with a weak solution of vinegar and salt or dilute sulphuric acid and water until every particle of foreign matter is removed. Next wash it with warm water and soap, to clear off the acid, and polish with a dry cloth. The brass is then ready to be painted.

THE GARAGE

A CONCRETE GARAGE.

Dimensions of Blocks — Laying Out the Courses—Number and Sizes of Blocks—The Molds.

PART II.

BY JAMES F. HOBART.

Having obtained a picture of a building suitable to one's needs and to the surroundings, as shown by the engraving on page 119 of the July AUTOMOBILE DEALER AND REPAIRER, the next work will be the making of the drawings necessary to show the dimensions and numbers of each kind of block needed. In order to make the nec-

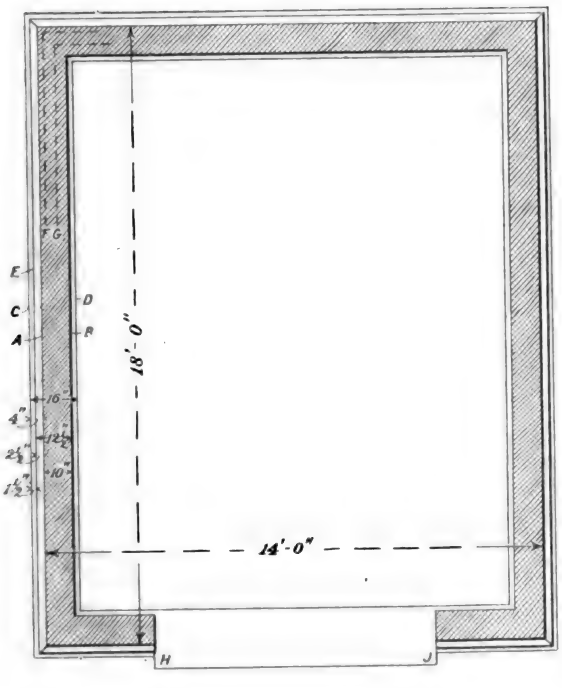


FIG. I—PLAN OF GARAGE.

essary blocks with the least possible waste, it is necessary that there be determined beforehand the exact number of each style, each length of each style, the number of window lintels and caps and the amount of bevelled block for water table. In fact, each and every block in the entire building must be dimensioned and listed. It will not pay to make up a lot of blocks and then cut and trim until they fit. Such a method may make a building, but it will not be either a profitable structure or a good looking one.

Full detail drawings will not be given here, as space forbids, but drawings enough will be presented to show the method of working them out, thereby enabling each person to make the necessary drawings for himself. If desired, the author will arrange to make working drawings of this garage of any desired style or size, to be made in concrete, to suit conditions and surroundings.

The first drawings necessary will be a plan view and side and end elevations. These views are represented by Figs. 1, 2 and 3 herewith. The plan view shows a length and width of the building; the lines *A* and *B*, extending around the building, are the walls above the water table, more plainly shown upon the side elevation, Fig. 2. The lines *C*, *D*, Fig. 1, represent the outside and inside lines of the foundation, or that portion of the walls below the ground line. On the elevations, this portion is shown as having a depth of three blocks, or about two feet. In most localities this depth will answer, particularly in sandy soil, but when the garage is to be built on clayish soil, the foundation must be carried down below the frost line—whatever depth that may be—in order that the walls may not be "heaved" and cracked by the freezing of the clay beneath the foundation walls.

If desired, this portion of the block work may be replaced by stone, or a trench may be dug and filled with small stones thrown in, the walls of the water table, *E*, *B*, being started directly upon the loose stones. In case blocks are used for the foundation as shown, they may be made in two widths, 10-inch and 6-inch, as shown by the dotted lines *F*, *G*, which also represent the manner of breaking joints in the courses. The water table, *E*, *B*, being 12½ inches thick, may consist of a 10-inch course of blocks backed up with bricks set edgewise, or blocks enough for those three courses may be made 12½ inches wide—something easily done with some block machines and quite possible with the home-made machine shown by Fig. 5, herewith.

The dimensions of the building are plainly shown by Fig. 1, and from this plan is to be laid out the side elevation, Fig. 2, the several dimensions being made up, or derived from those given in Fig. 1, and in the text of the paper in the July number. Allowing 8-inch thickness of blocks and ½-inch mortar joints, the height of the walls is found to be 9 feet 11 inches, instead of 10 feet, as stated in the text. These little changes in dimensions often come up when the details are worked out. Several cases of variation from the text will be noted in the height of door, etc.

It is supposed that 30-inch blocks will be used whenever possible, and the elevations are worked out to this length of block when that length fits. The foundation works out as shown by the dotted lines, *C*, *C*, Fig. 2, so that all the blocks but four in each of the outside and inside courses are 30-inch blocks on each side of the house, making sixteen short blocks in the foundation sides. List each of these blocks, keeping in mind that the foundation courses are double, 10-inch and 6-inch, according to location. Make lists of these blocks thus, and go all through the plans in similar manner:

BLOCK LIST.

Foundation—Three courses, 10 inches and 6 inches wide or thick.

Blocks in each side.

First course—30x10 inches, 16; 30x6 inches, 9; 22x10 inches, 2; 21½x10 inches, 4.

Continue in a similar manner to take off the number and length of blocks needed, laying them out on the drawing in a pleasing manner and to "break joints." The entire foundation courses are to be laid off and tabulated in this manner, taking care that the blocks for the inside courses are not erroneously made long enough to reach through the wall instead of to the outer course, as should be the case. As shown by Fig. 3, some special blocks

will be required for the threshold of the door, a wide block being used for the inside course instead of a narrow one, thus permitting the threshold to project 4 inches beyond the foundation courses, making that portion of the foundation wall 20 inches at *H, J*.

Next, work out the water table courses and list them in a similar manner. If necessary, make a sketch of each course of blocks in the garage, marking them in a manner not to be mistaken. The upper course in the water table must be bevelled on one corner as shown, though the bevel shown, 2½ inches, may be diminished if desired, and a narrow level ledge left around the top of water table. If the top course is bevelled as shown, it will require a corner with a face about 3½ inches wide to be laid into the mold when making the top course of water table. If the bevel is to be less, the face of the corner piece will be less than the width stated.

Look out for the vent openings in the bottom of the water table. In the text it was stated that these vents were to be 12 inches long. In working them out it is found that if they are increased to 13 2-3 inches, all the blocks can be regular 30-inch lengths, but if 12-inch holes be adhered to, pieces of blocks must be put in, making a bad job of it; hence the slight change as noted above.

Next, lay out the blocks around the window opening. Take some form of standard frame and work around it. The perspective shows a double window with twelve lights in each. This works out about right for 9x14-inch glass and calls for an opening 5 feet 2 inches by 5 feet 6½ inches, as shown by Fig. 2.

The arch is next laid out and the blocks dimensioned as shown. There will be eight circular blocks in this arch, all alike. The grating in the water table openings should be marked off after the first course of blocks has been laid. Then the holes should be drilled, the upper blocks placed in position without mortar, the holes marked for the upper ends of the bars and the holes drilled and the bars inserted when the blocks are set. This method brings all the bars to stand exactly vertical, thereby presenting a much better appearance than when some of the bars tip in various directions.

Next come the front and back ends of the building. The front elevation, Fig. 3, is to be worked up from the plan and from the side elevation, and care must be taken to break the courses properly from the sides to the ends, taking care that the blocks are not doubled at the corners, which might result in a block projecting into the air 20 inches or so, or a 10x10-inch corner being left vacant if the mistake be in the opposite direction.

In working out the blocks for the front, it is found that if they are made 20 inches long, they will overlap about 4 inches. Therefore it is necessary to use blocks 10x16 inches for the long effects on the front, both on the corners and beside the door. The door arch is worked out the same as the window was detailed, and as stated, it is found to be a little higher than called for in the text.

One of the peculiarities of designing is met with at the top of the walls, where the slope of the roof begins. The drawing shows two 16-inch blocks superimposed. If it is desired to have the wall end with a 10-inch block and the gable slope commence with a 16-inch block, as at present, some other arrangement must be made with the long and the short effects and it will be found quite a problem to bring that arrangement to pass and still have a long block for the arch over the door to spring from. Either the thickness of the blocks would have to be changed, or the door brought down one block, and the longs and shorts shifted one for another in the entire building, front and sides.

The door wants twelve blocks in the arch, each 9 inches long, and made to a radius of 7 feet 7 inches. A mold may be made for these blocks, or they may be made in the mold shown by Fig. 5, by laying in the proper wedges. The gable blocks may also be made in the same mold and made two at a time by simply laying in a diagonal piece of the proper thickness to divide the mold into spaces of the proper lengths. The blocks where the arches spring, may be made in a similar manner.

For making blocks, one of the 350 block machines now in the market may be procured, preferably of the "face down" type, or a mold may be made up as shown by Figs. 4 and 5 herewith. Make up two side planks, 10 inches wide as shown at *A*, then bolt to each a strip of angle

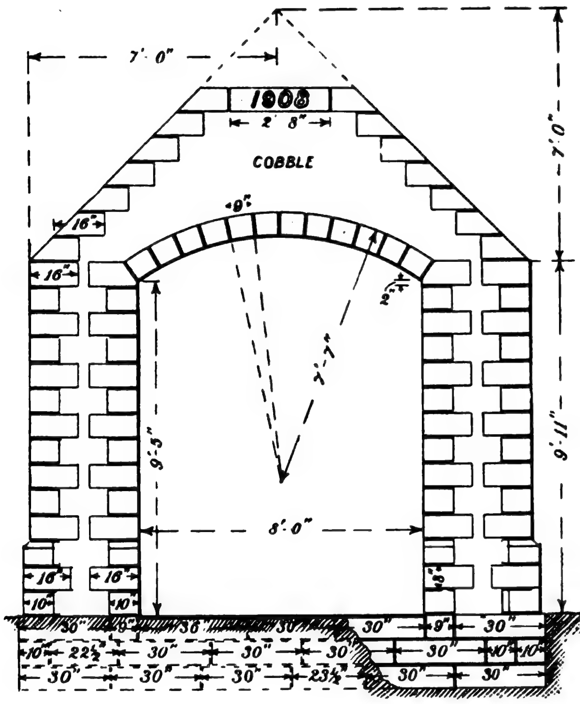


FIG. 3—END ELEVATION.

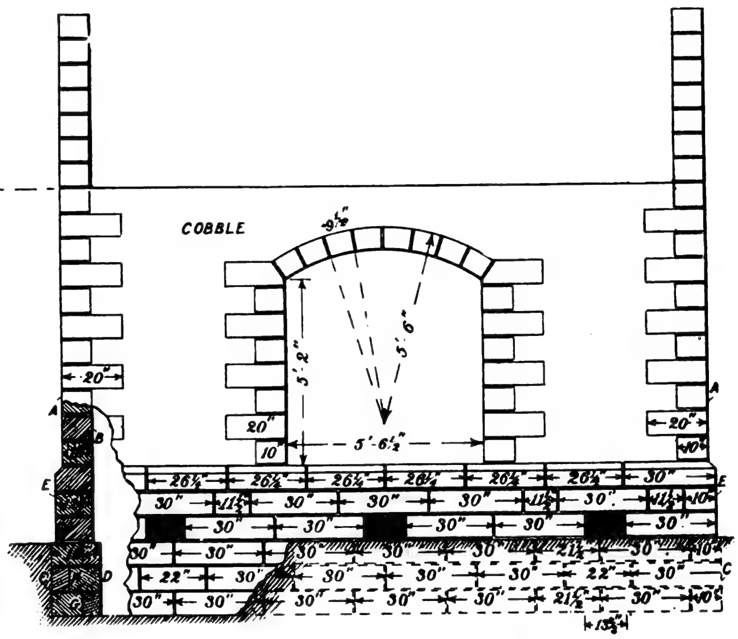


FIG. 2—SIDE ELEVATION.

iron *F*, to hold the ends of the mold in place. If angle iron cannot be obtained, a wooden block may be bolted on, but the angle shape is best. Fasten on the "wear piece," *W*, by means of small nails which are driven into holes slightly countersunk, after which the nails are filed smooth. These wear pieces may be made of wood, but if thin boiler iron is used, say 3-32-inch thick, the molds will last a long time without renewal. If ½-inch board

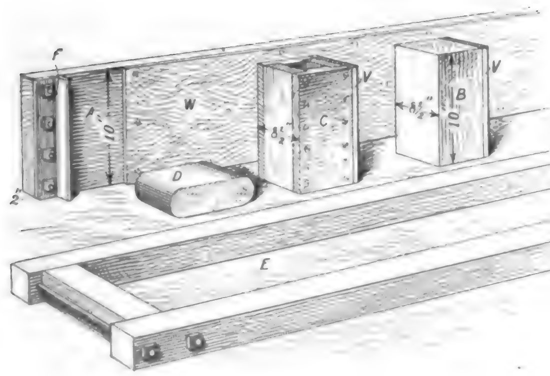


FIG. 4—HOME-MADE BLOCK MOLD.

is used as shown in the engraving, it must be renewed as fast as it shows signs of wear from tamping the stones and sand against it. If made of wood, the wear pieces should be well shellacked and all the other woodwork of the mold should be heavily shellacked—several thin coats being applied.

Make up two end blocks, *B*, which is merely a bit of timber squared up to fit the dimensions. If a better job is desired, something more permanent is shown at *C*, which is screwed together of hard wood with the grain crossed as shown. In either case, the wear pieces, *V*, *V*, must be attached the same as to the side planks *A*. The thickness of blocks *B* and *C* is shown to be 8½ inches, and that is right for a ½-inch wear board. If any other thickness of wear board be used the thickness of blocks must be changed accordingly, so as to be equal to the thickness of block required, plus one thickness of wear board.

Some form of clamp yoke must be made. If two or three iron clamps are at hand, they may be used, or a yoke made, as shown at *E*, will do the business. This affair may be made of 2-inch stuff, though 2½-inch is

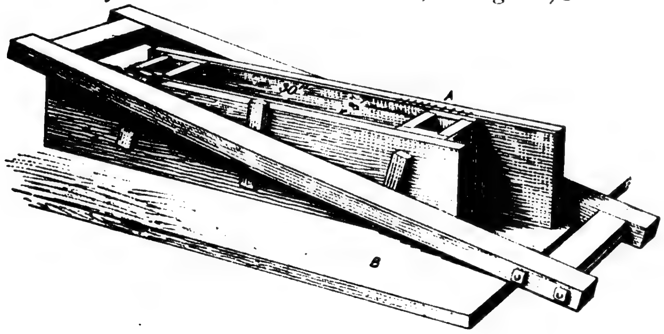


FIG. 5—BLOCK MOLD ASSEMBLED.

better. It should be made long enough to catch the mold as shown by Fig. 5, when the shortest block is being made. This clamp should be well bolted as shown.

The method of using the clamp yoke and the setting up of the mold is shown by Fig. 5. The mold is set up upon a bit of plank upon which the block is to be left when completed. This plank is shown at *B*. In closing the mold upon this plank, the two parts of the mold are slid past each other until the end block comes fair with a mark at *A*, which indicates the particular length of block to be made with that setting of the mold.

With the mold in place as shown, the clamp yoke is placed over the mold, one end of the clamp resting on top of the mold, the other end resting upon the floor or bench. The clamp thus crosses the mold diagonally, and the three wedges are inserted and lightly driven home until the mold is securely clamped and is ready for filling and tamping.

The 1¼ mixture may be used to advantage, a very thin sprinkling of fine sand mixture being dusted over the bottom of the mold—which is the face side—before the coarse material is put in. Tamp in thin layers, at least three to the block, using the mixture wet enough so that water comes to the surface of all the tamping. If it is desired to make cored blocks, prepare cores as shown at *D*, Fig. 4, and place them in the mold as required. The cores being tapered, they may be easily loosened by rapping lightly with a hammer and then carefully pull out by means of a handle placed in the hole in the larger end of the core.

The bevels on the water table blocks may be obtained by laying wooden corners of the required width of face in the mold, sides and ends being cornered as found necessary. The face may be left downward upon the plank, or if thought best, the mold may be rolled over and the face trowelled as may be found necessary.

The roof is a separate proposition and is not discussed in this story, which, the editor says, is already too long. Such further information as may be found necessary will be given upon request, and complete working drawings—including roof—may be obtained as stated, if desired.

AUTOMOBILE LAWS.

Inconsistent and Contradictory Provisions in Various States.

In a summary of the motor vehicle laws of the United States, Charles T. Terry, counsel of the N. A. A. M., says:

"They are ridiculous because of their inconsistent and contradictory provisions, and they are intolerable because of the fact that no two States have been able to agree upon a reasonable and sane law, which would regulate the automobile as it should be regulated and at the same time conserve the rights of pedestrians and users of horse-drawn vehicles. The farmer is not as hostile to the automobile as has been represented by the demagogues in our legislatures.

"Without fair laws good roads are of no use to the automobiles. In thirty-one States we find registration of motor vehicles is required. In each State there is a different requirement, and the fees range from 25 cents to $25. In six States the local authorities may require registration in their particular localities. In ten States a license to operate is required in addition to registration. In eight States the registration and license laws of the other States are entirely disregarded and non-residents passing through are required to re-register their vehicles and pass an examination as to their competence to drive. In four States non-residents, exempt from the registration provision of State laws, are not exempt from registration and license requirements enacted by local authorities. In seven States non-residents are exempt for periods of time ranging from twenty-four hours to sixty days.

"The most striking illustration of ridiculous and intolerable State enactments to be found is in the Eastern States. In matters of speed and rules of the road the automobilist is not only hampered by the divergent and contradictory State laws, but in most States he is subject to restrictions imposed by local authorities. The speed limitations range from four to twenty miles an hour,

changing according to locality, and the automobilists, without the slightest negligence or danger to other users of the highway may violate the speed laws six or seven times in a run of sixty miles.

"There are only two States which at the present time have reasonable and sensible speed limitation provisions. They are Connecticut and Florida. On the whole our motor vehicle laws form a most striking demonstration of the extreme provincialism of our most important States, and I have found, after thorough examination and after appearing before many meetings of farmers and residents of small places, that the cry of the State legislators to the effect that the farmer is hostile to the automobile and that he demands these radical provisions in the law is without truth. The kick is not from the farmer, but rather the chief politician and demagogue, who is ever ready to make capital out of the nearest available material.

"The salvation for the automobilist and also for the average citizen is the enactment of a Federal automobile registration bill, as has been drafted and presented to Congress by Representative Cocks, and there is not the slightest question in my mind about it becoming a law, because it is recognized as the only right and expedient means through which all interests may be adequately and equitably taken care of."

CAREFUL DRIVING.

How to Save the Car, Avoid Accidents and Not Be Unpopular.

When in doubt, don't try. Don't take a chance unless between two evils.

Don't go too quickly near the pavement in case a deaf person, or some one engaged in other thoughts, steps off into your track. When passing a street car, face on, toot loudly to provide for a person walking across from behind who might be bewildered by the confusion. Go too slowly rather than too quickly. If you make an error make it on the safe side.

Always remember that any useless revolutions of the engine—that is, when the engine is running light, are so many moments less life to its existence. It is an unnecessary cost of gasoline, lubricating oil and wear and tear —a noise, a discomfort and an irritation to people and mechanism.

A revolution saved is a revolution gained. There is an economic, a durable, and a pleasant speed to an engine, just the same as there is to a living person; a speed at which a person can walk and run without destroying the tissues or overexerting the muscles of the system, so with the piston of an engine.

An engine working the car and running light is under two distinct differences. Working, the car has the flywheel power of the car; it is "backed" by a ton in motion with itself, and it is thus held "steady." Running light, it has no staying power. Therefore, before declutching, throttle down your engine. Before starting your car throttle down to the extent that the engine will easily "take hold."

Never draw up with your brake if you can do without it. It is a penny wasted on tires every time you do so. Withdraw your clutch in anticipation of the place to stop at and just bring the "stand still" with the brake. It is an act of bad driving to rush up to a stopping place and apply the brakes. Such a practice scares the people near, and the car occupants may think that perhaps the brakes won't act.

A FINE PUBLIC GARAGE.

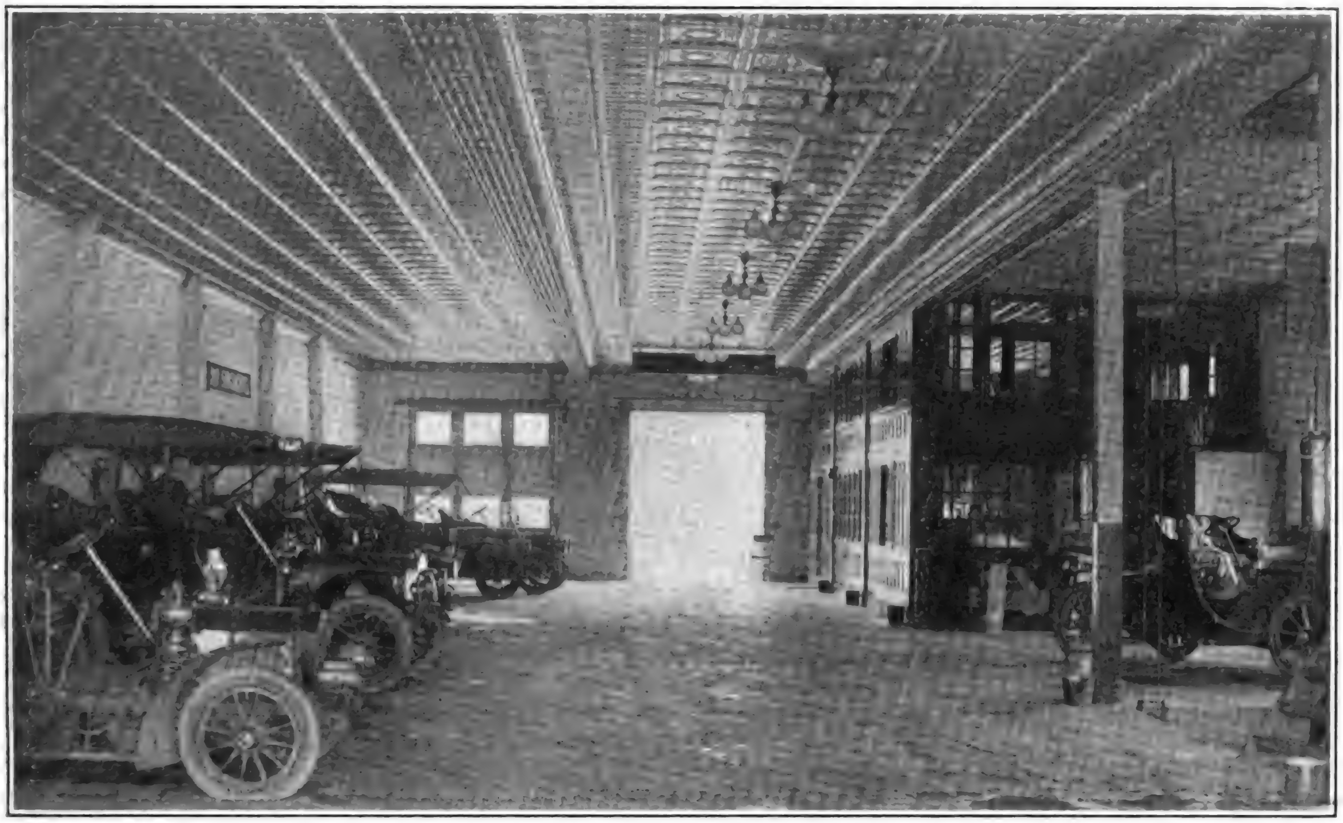
An Example of Enterprise, Progress and Faith in the Future.

Progress in garage construction has fully kept pace with that of the automobile itself. Three or four years ago, before it was fully known that the automobile had

GARAGE OF THE JAMAICA MOTOR COMPANY.

come as a permanent and universal vehicle for all purposes, there was a tendency to make almost any building answer for the housing of this valuable machine and carriage, but now garages are springing up everywhere that are a credit to the cities and towns where they are located and which serve to give the business a dignity and consideration which its importance demands.

There has recently been constructed in Jamaica, Long Island, a garage—the largest on the island—which is a decided credit to the town and to the foresight and business ability of its owners. It is on the south side of Hillside avenue, near Flushing avenue, and is the property of the Jamaica Motor Car Company, the officers of which are Joseph A. Jones, president; John Leonardi, treasurer, and Frank B. Anderson, secretary.



INTERIOR OF THE JAMAICA MOTOR CAR COMPANY'S GARAGE.

It is two stories in height, of brick and stone, and 50x 150 feet in size, with cement floors and metal ceilings and of the most approved fireproof construction. It contains every modern equipment for the storage and care of automobiles, and the garage is patronized by many of the automobile owners of Jamaica and elsewhere.

Between the upper and lower floor of the garage is a mezzanine floor containing finely equipped offices of the company, while near the entrance to the building is another office for the bookkeeper and clerks. In the upper floor is a repair and machine shop so fully equipped with men and facilities that automobiles are regularly taken apart there, overhauled, repaired or rebuilt.

There was recently overhauled there the Woolsey car that was raced in England against many other cars and won. It is 120 horse power and one of the fastest cars yet constructed. This car is being prepared to enter the Vanderbilt Cup race on Long Island next autumn. It will be driven by John Leonardi, of the company.

The garage is open night and day, is finely illuminated in front by electricity, the company manufacturing its own light and getting its power from a powerful dynamo.

Fouled Cylinders.

The knock or thumping which occurs in the engine on opening the throttle beyond a certain point quite spoils the running of a good car. The true cause in practically every case will be found to be fouled cylinders and carburation too rich. The carbureter requires attention from time to time, as however finely set at first continual running will always be tending to spoil the adjustment of the needle valve, causing occasional flooding at the jet when the throttle is opened up. In a perfectly clean cylinder the result would be only a marked falling off in power; on full throttle the engine may even fill up altogether. When the cylinder is in a fouled condition and the top of the piston has a deposit of carbon from one-sixteenth to one-eighth inch thick, preignition inevitably results. There are other factors helping toward this, such as the increased compression on the greater volume of gas and the slow burning gas remaining in the exhaust ports from incomplete combustion.

Emergency Gasoline.

Some drivers make it a point to carry a small extra pan of gasoline with them so as to have some fuel in case the regular supply suddenly becomes exhausted. A more convenient way to carry it is in a box specially made for the purpose under the footboards in the back seats. If it does not fill the box tightly it should be packed firmly so that it cannot move about. One owner of a small two-seater has adopted the plan of fitting a box upon the right hand step which is just large enough to take a special one-gallon can which he has had made. This can is made of sheet steel, and is better than the ordinary gasoline tin. In the small running tank of a two-seated car a gallon is equal to two in the tank of a larger car, and is therefore quite enough to carry for emergency.

TWO IMPORTANT POINTS.

Accessibility and Cleanliness Are Closely Associated.

The ideal of cleanliness is that the whole exterior of the car should be smooth and easy to clean; that no mud or dust should be able to be thrown by the wheels upon any part of the mechanism, the steps, or the carriage body; that all working parts should be thoroughly protected from grit; and that all oil drippings from the engine and gear should be caught and retained in a detachable receptacle easy to remove and clean out.

The great question on which the whole problem of accessibility hinges is this: Why is it needful to be able to get at any parts of the mechanism? If it were not, the matter of cleanliness would be an easy one, as one could seal the whole mechanism up, like sardines in oil, and let it look after itself, and yet always keep the exterior spick and span. Under these circumstances it would necessitate the designer so proportioning the various parts of the car that nothing would ever need adjusting or replacing, and the end of the car would be like the one-horse shay, which collapsed into nothingness after its period of life was fulfilled. Unfortunately for us, it is impossible so to foresee the very varied conditions of working and attention, or rather lack of them, bestowed upon our productions by those responsible for the running of our cars, that they will wear out evenly, nor is it possible to provide absolutely against accidental breakages.

This being so, it may be necessary to remove or adjust any part; and so to obtain the ideal of accessibility, we may lay it down as an axiom "that we ought to be able to remove any one part without disturbing any other." This ideal, like all ideals, is practically impossible of attainment; to approach within reasonable distance of it would necessitate every part being exposed and in view, which would prevent us obtaining efficient means of protection, and jeopardise our ideal of cleanliness. The best we can do, therefore, is to study the easy removal of those parts liable to wear, and use as a foundation on which to build up these parts all pieces not so liable.

REMOVING BODIES.

The very first thing to consider, therefore, is the general scheme of the whole car, and in this the body which is to be used is the item of greatest importance.

What is the use of having an engine nicely housed in a bonnet in front, easily opened and inspected, if the gear box and other vital parts are covered up and made inaccessible by the carriage body, as on a car I found stranded by the roadside the other day. In this, one of the gear wheels was pushed into mesh by a fork, which, having become strained, refused to work. It was almost impossible to do anything to it, as the carriage body was in the way of the cover of the gear box, and was so fixed that it would have taken a long time to remove.

The body, undoubtedly, should be easily raised or moved so that all running gear can be easily and efficiently inspected.

Now, the position of the carriage body depends principally upon the permissible wheelbase. What is the maximum wheelbase which is easily handled and utilized in all districts? I have come to the conclusion that 9 feet is the maximum, and I arrive at this figure from experience of cars of various wheelbases. On some roads a car width of more than 5 feet 6 inches, and of more than 12 feet in length over all, is impossible, as the following details of typical roads may show.

Take, for instance, two roads leading to a house. The house can be approached one way up an incline of one in six to a right angle turn, then one in five and a half to another like turn, then a few yards of one in five to finish. This road varies in width from 10 to 16 feet. The other road only rises one in twelve, but is in some parts only 8 feet wide. Luckily it is straight. This shows what in ordinary every day work a car may have to contend with, and practically fixes the maximum length of a car for every day use.

Having the size of a suitable carriage body, we can ascertain the amount of available space for engine, etc. Take a landaulet body, the type most in vogue. This to be really comfortable must have a total length from dash to back of 108 inches, which, you will notice, is the same as the wheelbase.

As it should not project behind the center of the rear wheels to give absolute comfort to the passengers on the back seats, the dash will come level with the center of the front wheels. This does not give enough room for an engine of the ordinary accepted vertical type in a bonnet in front; it is thus imperative to adopt some other position for the engine, or curtail the seating accommodation. If the engine is a vertical one, it can be placed in a bonnet between the driver and passenger in front, or it can be arranged under the driver's seat. Another way out of the difficulty is to utilize a horizontal engine.

To render every part accessible, the body is made to rise on hinges at the back, which done, the whole of the running gear, and not merely the engine, is at hand and in view. Should not the gear box, etc., be cleaned and inspected just as often as the engine?

To inspect the engine and gear box separately, the front and back floor boards can be removed, the former for the engine, and the latter for the gear. As to the removal of the floor boards for inspection purposes, if these are made to lift out there is a great liability of the mud and dust collected on them being emptied on to the parts below.

NUTS AND SPANNERS.

As a general practice, it may be laid down that the whole of the chassis should be erected so that every part is accessible from above. The true meaning of this is that with a car so designed a pit is no longer a necessity, and also that the most perfect cleanliness can be arranged for as the under shield can be made absloutely continuous and permanent.

There are certain items which at first sight appear to have no part in the making of accessibility, yet in reality do so. One of these is the method employed of locking nuts, and another is the size and position of nuts used. Dealing with the latter point first, it should not be necessary to use special spanners for any nuts. Every nut should be arranged so that it can be got at either with an ordinary tubular box spanner or an ordinary flat spanner.

The number of sizes of nuts used in a car should be reduced to a minimum, and five sizes are all that are really necessary. This will require only three tubular box spanners, two double-ended and one single-ended, and three ordinary flat spanners, two double-ended and one single. How very different from the kit necessary with one well-known make of car which consists of seven sizes of ordinary spanners, a jet spanner for the carburetter, a hub spanner, and two adjustable spanners, eleven in all. Why these last should be necessary is a mystery unless to use on some accessories, of which there are too many on the market with odd sizes of nuts.

Of the spanners mentioned as necessary for a car, the jet spanner is the smallest, and this is made to fit all nuts on the ignition parts. All screws on the carburetter, etc., have hexagon heads to fit this spanner as well as a screw-driver slot.

In the consideration of the position of nuts and bolts, it is sometimes a practice to arrange them through a boss; this in nine cases out of ten projects outside the case or

whatever part it belongs to. It is also common to find gear cases and engine cases shaped so as to fit close to the gears inside. When a case is so arranged it may be very nice designing, but if it were smoother and flatter outside, the bosses being arranged as much as possible inside, the weight would not be very much if at all increased, it would be much more easily cleaned, and it would simplify the pattern making, and in all probability cheapen the moulding, and perhaps make the holding of the piece in its jig for machining much easier. The most important point about having cases smooth outside is so that, in the event of anything requiring to be done inside, the outside may be made absolutely clean before it is dismantled. Under these circumstances, grit will not find its way into the interior when the parts are in the hands of the repairer.

The repairer's lot is not altogether a happy one, as he is supposed to know all about a car which he may never have seen before, have a new part in stock to replace a broken one, and charge less for doing the work than the new part is generally worth. It is as well to consider him somewhat, for when a car does get into his hands which is easy for him to handle, he can help a great deal. At the same time, one must remember he can do the reverse.

To Avoid Skidding.

Skidding is one of the most dangerous contingencies that the motorist has to guard against. There would seem to be no law governing side-slip, and at times no amount of skill in driving will entirely prevent it, though the danger may be modified. Side-slips may be divided into two classes:—

Due to grip on the road surface being insufficient to enable driving wheels to propel the car. In this case, as the road friction is not likely to be the same under each driving wheel, the differential enables the wheel having the better hold to do more than its share of propelling, with the result that the car is slewed round out of its course. This is the form of skid which is the easiest to correct, for it is only necessary to take the clutch out.

Due to either change of direction of car or reduction of its speed under conditions when road surface is slimy and treacherous. This class of side-slip has huge possibilities, and can only be avoided by driving slowly, or, in fact, as if all brakes on the car had been dismantled. Carefully watch the way in which the road happens to slope, especially round corners. Of course, with non-skid chains, bands, or studded tires, these difficulties mostly vanish, but it must be remembered that a man who has never learned to drive without such devices becomes hopelessly lost if he happens to be driving a car having tires with plain treads on a slippery road. Apart from bad road surface, skidding is promoted by a faulty differential, unequal adjustment of back brakes, frame or axles being out of alignment, sudden engine acceleration, or one tire having slightly greater diameter than its fellow.

A Motor Car Merger.

There are mergers and consolidations in almost every other form of manufacturing business. Why should automobile manufacturing be an exception? The first combination of this kind is reported to be now forming, to be known as the International Motor Company, with $25,000,000 capital, $11,000,000 common and $14,000,000 preferred stock. Among the underwriters of the $900,000 of preferred stock which will be first put out are, it is understood, several members of the banking house of J. P. Morgan & Co., although the banking house itself does not figure in the transaction. If the negotiations now under way are successful the company will be ready for operation by September 1.

According to present plans, the first two companies to combine under the International Motor Company will be the Maxwell-Briscoe Motor Company of Tarrytown, and the Buick Motor Company of Jackson, Mich. About half a dozen other plants will be brought into the organization with these two companies, and options have been obtained on other properties, including a number which furnish raw materials, so that when complete the concern will be the biggest of its kind in the world.

The plans call for a big output of automobiles upon the completion of the merger, it being estimated in the preliminary papers that 13,000 cars, *including* those already finished, can be built for the present year, and this number increased to 15,000 cars next year. On a product of this size it is figured that earnings of 7 per cent. can be made upon the preferred stock, and not less than 25 per cent. netted for the common stock.

A Single-Cylinder Victory.

The result achieved by the little single-cylinder Delage car in the race near Paris July 6 is something to dream about. This car, in comparison to the racing monsters that competed the following day, is a mere toy. Yet this car, carrying two passengers, averaged more than 80 kilometers, or 50 miles, an hour for 286 miles.

A competent report has it that in this distance the car was not stopped once at its control in front of the grandstand, though presumably it picked up oil and gasoline elsewhere. After the race, during which time the engine, of course, had been driven at its best, the cylinder and other parts were dismantled and there was no visible evidence of any overheating or wear.

It is stated—by the French—that the horse power of the winning Delage is 18, but this probably is slightly overestimated. The regulations for this year's small-car race stated that single-cylinders must not exceed 100 millimeters in bore. Stroke was not restricted, but that of the winner was 150 millimeters. The weight restriction was 600 kilograms, with tanks empty; detachable rims and wheels were barred.

It Is Enough to Stop the Car.

When a motor car driver is given the signal to "stop" by the driver of a horse, the question arises as to whether he must stop his motor as well, or whether he may simply declutch and, while bringing his car to a standstill, let his motor run. In a legal battle involving damage claims against an automobilist whose machine, although brought to a stop at the roadside, frightened a team of horses with the purring of the motor, the District Court of Minnesota decided that when under the State law the horse driver commanded the motorist to stop, the latter should have stopped the whole works and not the car alone. On appeal, however, the Supreme Court of the State reverses the lower court and indicates that when the motorist stopped his car he did all that was required of him under the law.

To guard against automobile thieves who visit garages a British inventor has brought out an alarm whistle, which may be heard several miles, operated by a compressed air tank attached to a garage in such a manner that it is blown when the door is opened by another than the owner. A better plan is to keep the door locked or hire a watchman and give him a gun.

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ADVERTISING RATES MADE KNOWN ON APPLICATION.

NEW YORK, AUGUST, 1908.

Missing Numbers—Our readers are requested to remember that it always gives us pleasure to re-send numbers which have gone astray in the mails.

WOOD OR WIRE WHEELS.

Some instructive tests have recently been made in England to compare the side stress resistance of wire and wood built wheels. The method of testing was as follows:

A pendulum weighing about 450 pounds was hung from a ceiling. The wheel to be tested was mounted on a massive steel mandrel turned down at the end to take the wheel hub, and anchored to a solid bed of concrete. The pendulum end, or bob, was adjustable for height, so as to bring it opposite the rim flange of the wheel under test. Pulley tackle was used to haul the bob away from the wheel, and was fitted with a simple device for releasing the bob, which swung with great force, over a distance of about six feet, up against the wheel.

After each wheel had been tested in this manner, they were again mounted on the mandrel, but with the point which had been struck by the bob at the bottom, so that the wheels would be struck at a point diametrically opposite to that at which they were struck in the first test.

The relative merits of the two wheels to withstand what would be equivalent to violent side-slipping on the road were judged by observation of the effect of each blow, measurement of the permanent deflection at the point of impact, and the amount of energy imparted at each blow.

The result was that although the energy imparted to the wire wheel was somewhat greater than to the wood wheel, the deflection of the wire wheel was .16 of an inch less than in the case of the wood wheel. Moreover, the damage to the wire wheel was more local or centered in one spot than in the case of the wood wheel. The damage sustained to the wire wheel was chiefly manifested by the spokes breaking away from the heads at the hub, and in a few cases from the nipples at the rim. In only one case did a nipple pull through at the rim.

The damage to the wood wheel, on the other hand, spread erratically over the whole wheel, manifesting itself by split felloes, spokes broken across, and pulling out of the hub flanges, also spokes pulling out of the felloes or breaking across at the dowel in the felloe. These general effects were observed throughout all the tests. It was also observed that the wire wheels gave gradually to the impacts, and did not collapse suddenly, as was the case with the wood wheels.

The results of the tests, which seem to have been fairly made, demonstrate, contrary to general impression, that wire wheels are able to withstand sudden side shocks better than wood wheels. As to the weight of the wheels tested, the set of four wire wheels weighed, including the inner hubs, 149.7 pounds, and the set of wood wheels, 179.84 pounds.

Nothing more need be added to this save that the tests seem to have been made by a wire wheel manufacturer. Possibly—but not probably—the result might have been slightly different had the tests been made by a wood wheel manufacturer.

SPEED DANGERS.

Possibly those addicted with the perilous speed mania may be interested and benefited by having their attention called to the increasing dangers of accelerated speed in case anything happens to their car and they are thrown out. One of our subscribers, Mr. S. F. Kennedy, has prepared a table which shows how rapidly the danger of death increases with the speed. He says:

"The following scale of motor velocity is compared with the corresponding height from which a body must fall, under the law of gravitation, to attain the same velocity. In other words, one being thrown from a car under motion may see from what height he must fall to suffer the same impact of resistance."

Miles per hour.	Equivalent height of fall.
10	3.37 feet.
15	7.56 feet.
20	13.45 feet.
25	21. feet.
30	30.25 feet.
35	41.15 feet.
40	53.78 feet.
45	68.06 feet.
50	81.67 feet.
55	101.68 feet.
60	121. feet.
65	142. feet.
70	157.3 feet.
75	189. feet.
80	215. feet.
85	243. feet.
90	272. feet.
95	299. feet.
100	325. feet.

From the foregoing it will be seen that if one is thrown from a car while it is going ten miles an hour, it will be equivalent to a fall of 3.37 feet. Now a fall from such a height is likely to cause quite a jar and possibly break a bone, but unless in the case of a very old person, or one who is extremely heavy, it would not be fatal. But a fall from the car when it is going thirty miles an hour is equivalent to falling from a height of 30¼ feet, and thus the shock would be nearly ten times greater than when the car is going one-third as fast, or ten miles an hour. Any one who falls this distance is fortunate to escape with his life. But to be thrown from the car when it is going at the rate of sixty miles an hour is equivalent to a fall from a height of 121 feet, and in this case if the victim is not ushered at once into eternity, he is pretty sure to be a cripple for life, which is about as bad.

But there is another important consideration to this subject: Although, as will be seen, the force of the fall increases far faster than the speed of the car, the chances

of a fall multiply still more rapidly with speed acceleration. For illustration, while riding ten miles an hour on smooth and level highways, with nothing ahead to necessitate a sudden stop or turn, the chances of an accident are quite as remote as the result is unlikely to be serious. But as the speed of the car increases, the liability of accident is multiplied several fold, until when the speed of the car reaches fifty miles an hour, not only is an accident likely to occur at any time, but the result of such accident is almost certain to be fatal.

WHICH?

Which is it to be?

Are the highways to be given over entirely to automobiles, so that they may be used by them at whatever speed the driver of the car may elect?

Are they to continue to use them along with other vehicles, in conjunction with the use of the highways as playgrounds for the small boy, resting places for domestic animals and as meeting places for adults for quiet confabs?

Are they to be made to go at a safe speed on these highways, with due regard for their condition, and to their general use as stated in the preceding paragraph?

Are they to have special highways, just as steam railways now have, with no other users, so that they may be speeded according to the will of their drivers?

Are these highways to be made so smooth that it will cost about half for propulsion of what it now costs, and about half for general maintenance, and at the same time permit a reduction of about one-third in their weight?

One thing is certain: Travel will not continue as at present. The man who owns a car that he knows may easily be driven 40 miles an hour on good roads, will continue to make this speed whenever he feels disposed, which will be when he is not likely to be apprehended by the agents of the law; and thus accidents will continue to occur just as they are now occurring, and the reckless will continue to lose their lives or take the lives of others. Neither legal nor moral suasion will prevent it, although they may lessen and diminish it, and so-called "police traps" may somewhat abate it, here and there, for a time.

But it is useless to imagine that the owner of an automobile which can be speeded to 40 or 50 miles an hour will always limit its speed to 15 or 20 miles an hour. And thus, under present conditions, there will always be more or less trouble, until a vehicle that is intended to go 50 miles an hour can be made to do so without endangering its occupants or any one or thing else.

TRIFLES.

It is noticeable that the driver of the Thomas car in the New York to Paris race offers as an excuse for getting behind in Russia the fact that he got off the right road and was unable to understand the directions of the natives for getting back upon the right road again. But this is no excuse. The Thomas car driver should have been as well prepared for this as the driver of the German car. Trifles of this sort are what may lose the race and what might have been expected would lose it.

There has been evidence all along that the Thomas car is the best for the purpose designed. The fact that it is lighter and yet capable of quite as hard usage is in itself conclusive of this. And if this car had lost it would without doubt have been because the German car had the better driver and crew.

We refer to this matter only because in all such contests something that could and should have been guarded against is often given as an excuse for failure when, if the man who took "the message to Garcia" had been there no such accident would have occurred.

What the world needs more than anything else in car drivers and car makers is men with whom things do not go wrong. And it likewise needs them in all departments of business life. Trifles make things go wrong and trifles make them go right.

WOMEN DRIVERS.

The mayor of Cincinnati has publicly expressed the opinion that the fair sex should not be allowed to run automobiles. But it all depends. If he had said that some women are not fit to run them, and then added that some men are likewise not capable of becoming good car drivers, he would have come nearer to the facts. Some women should not be allowed to drive a horse. They worry the horse to death with sympathy. Others worry a horse to death by hard driving. On the whole, we should rather trust a horse with an average man than an average woman.

The woman lacks judgment. She often imagines that the horse is going up hill, when the animal is simply lazy, and often urges him going up a hill thinking him lazy, when he is simply exhausted.

Women are too often swayed by impulse and feeling. In the case of driving the horse they push the animal when they should curb him, and they curb him when they should allow him to speed along.

On the whole, it may be set down that a woman who can be safely trusted to drive a horse can be just as safely trusted to drive an automobile. Likewise it must not be forgotten that it may be safe enough to drive a horse six miles an hour and dangerous to drive him twelve miles an hour, just as it may be safe to drive a car fifteen miles an hour and dangerous to drive it thirty miles an hour.

TIME TO CALL A HALT.

A car manufacturer, whose name we do not feel at liberty to disclose, writes us that in his opinion it is a mistake to "stir up the accident matter so much."

Our friend is wrong. It would be a mistake not to "stir it up." Accidents are altogether too frequent, too unnecessary. They reveal an appalling state of carelessness and ignorance, and injure the business far more than anything else it encounters. The remedy is not to cover with excuses or attempt to conceal the enormity of these offences. Publicity is the only cure for them.

We do not give space to these flagrant and wicked instances of carelessness because we like to do so, but because it is our duty to do so.

It is indeed a pity that the safest vehicle that ever man has used should be impaired in reputation and character by the few who do not take ordinary or proper care in its use.

Getting knocked into eternity by a railroad train, crashing into a telegraph pole, getting overturned by running into a ditch, running into another vehicle which is hidden in a cloud of dust, setting fire to a car by the careless use of matches or other flame, meeting disaster through skidding, and, in fact, nearly every case of disaster, is due to human and not automobile weakness.

We propose to do what we can to put a stop to such wanton and reprehensible destruction.

It is almost exactly 100 miles from Nashville, Tenn., to the Alabama State line, yet within that distance an automobile is obliged to pay $1.95 in tolls to turnpike companies.

LESSONS FOR DRIVERS.

Carelessness and Ignorance Responsible for Most Accidents.

In its final analysis, and sifting the matter back to first principles, the automobile manufacturer himself is primarily responsible for more than his rightful share of car accidents and consequently for much of the prevailing opposition to automobiles on the part of the general public which does not use them. Manufacturers make cars that they guarantee to run fifty and sixty miles an hour, when it is simply courting death to run an automobile or any other vehicle at this rate of speed on the highways of this or any other country. And possessing the power to run at this reckless speed, and the tacit invitation to do so, it is little wonder that there is a constant temptation on the part of owners and drivers to exercise it. Yet it is this recklessness that is the greatest bar to their more general use. Just how many are deterred from purchasing cars owing to the totally unfounded fear that they are dangerous, it is, of course, impossible to state, but it is responsible for the loss of more sales than any other one cause and for many more than any question of economy. Every automobile accident is liable to prevent a sale, and the papers teem with reports of them. But should such reports be omitted? By no means. Nothing is ever gained by covering up or disguising the truth. And nothing will so curtail these accidents and so quickly convince the general public of the undoubted fact that the automobile is the safest vehicle—speed for speed being considered—of any that exists.

STEPS FOR REFORM.

About a year ago the Safe Roads Automobile Association was formed in Massachusetts. Its object was to lessen as much as possible the dangers attendant upon reckless automobiling and to carefully investigate every case that might arise out of their use of the roads. The organization has pust presented its annual report and it is of interest to note some of its findings.

In the first place the records show that automobiling is contributing a large number of fatalities every year, and so far as Massachusetts is concerned, the dangers to those who are in the machines to those who are not is as one to two. Out of 62 fatalities reported in that state for the twelve months ending June 30, 21 persons were in automobiles and 41 were not. In addition to these fatalities no less than 640 persons were seriously injured. The report does not state the proportion of injured persons who were in the cars.

The report goes on to show further that the Association prosecuted thirty-five cases of reckless driving before the Massachusetts Highway Commission. As the result of these prosecutions, thirteen licenses were revoked, while nine others were suspended for various periods of time, and the balance were disposed of in one way or another, some with a caution administered, or a warning not to do it again. Only one case was dismissed.

In conclusion the Association says: "Our first year's work and investigation confirm us in our belief that a large majority of the automobile operators run their cars carefully. And of course this is true. It is the few utterly reckless ones who bring discredit upon the great majority, and cause the serious accidents that are reported every now and then."

The foregoing is quite true, but there are very few accidents when cars are run carefully. Of course, many accidents occur which are the fault of other users of the highways. But of these we are not at present concerned; the small boy will long continue to use the highways and streets for a playground, domestic animals will wander aimlessly up and down them, and adult human being will continue to cross them without taking the trouble of looking more than one way.

Although the courts have decided frequently that in case a car is being driven at slow speed and runs over a boy, who suddenly attempts to cross the street, the car driver is not to blame, if he did not see the lad until it was too late to avoid him, yet no one wants to take a human life, whether it was unavoidable or not. Moreover, it has always been held that on all public thoroughfares the right of way belongs first to the pedestrian.

Accidents due to making sudden turns, while going at a fast speed, still continue. It should not be assumed that the liability of overturning comes only when an attempt is made to turn at a sharp angle. Even when making a slight deflection the car is liable to "turn turtle" if it is running rapidly. The accident in France by which the step-son of W. H. Vanderbilt was killed, came about through an attempt to round a sharp curve. If the car was going at the speed reported, it would have overturned even though the curve were slight, provided the outside wheels had struck some obstruction.

THE SPEED MANIA.

Under the head of "Suicidal Scorching," a writer in the *New York Sun* makes the following observations concerning three recent and particularly appalling tragedies:

"In the first case the papers estimated the speed of the car at above seventy miles an hour. The man driving 'was hurrying to reach his family.' Was he not probably hurrying to beat a record, and has any man with a family the moral right to take such frightful risks as he is said to have taken?

"In the second case it was stated in one newspaper, at least, that 'while Mr. —— and Mr. —— and Mr. ——'s son (who was driving the car and was killed) had stopped at several road houses, none of them had taken many drinks.' What would be said of a railroad engineer in whose defence it was urged after a wreck that 'he had not taken many drinks?' What would be his fate if he survived? He would be convicted of manslaughter, whereas under similar conditions the motorist, who is undertaking a more dangerous task, goes free, if not killed, and if he is killed it is spoken of as an awful tragedy. Why, the name is a mockery. It is sheer suicide! The blame in the accident near New York was laid upon those who failed to light the approach to the bridge. Would not a driver with his faculties clear and with a properly and adequately lighted car, and running at a reasonable speed, have been entirely independent of lights on the bridge?

"The third case was one of the particularly vicious forms of recklessness, the crossing of a railroad track, without taking precautions. In this instance 'the men were running at a rapid rate and crashed through the gates at the crossing directly in the path of a train. Both men were horribly crushed.' A chauffeur who will crash through a closed gate is either too blind to be entrusted with the running of a car, has been drinking, or else his car is without a proper headlight. One of these three conditions is in nine cases out of ten the cause of similar disasters.

"Such reckless and crazy driving as occurred in these three cases casts discredit upon lawful motoring and prejudices the non-motoring public against the sheep and goats alike. Those who are conservative, careful and law-abiding are classed with the delinquents without distinction. Why should a pastime, harmless, rational and reasonable, when those who indulge in it abide by the laws, be made a curse and a source of terror to the community?"

RESULT OF TURNING THE HEAD.

The foregoing is none too severe to fit the cases, although if the writer imagines that they are singular or

sporadic, he is much mistaken. They are like hundreds of others. The prominence of the victims was what gave the matter more publicity than usual. It should likewise be stated that in the case where the young man lost his life by running into the railing of a bridge, the accident would never have occurred had he kept his eyes ahead, where they always belong when driving a car. He turned around to make some remark to his companions and the car swerved. It is nothing unusual for chauffeurs to turn their heads backwards to talk to those on the rear seat, but it is a practice that should always be avoided when going at a high speed.

THE STEERING GEAR.

Accidents due to various alleged faults of the steering gear still continue, although possibly they have diminished in number in comparison with other causes.

Near Pittsburg, Pa., five persons were seriously hurt, when their car went into a ditch after "something went wrong with the steering gear." Whether this was the real cause will never be known. It is always a good excuse for an accident, when nothing else will answer. Yet the steering gear is something that should invariably be frequently examined and tested.

In Roger Williams Park, near Providence, R. I., the steering gear broke in a car containing two men, and it went down into the water. The men came near drowning, but were finally extricated by park employes. The car was pretty well wrecked.

BETTER TO SLOW DOWN.

In cases where a car is being driven slowly in the street, and it runs over some one or knocks a person down, it has usually been held by the courts that the driver is not at fault. For instance, in St. Louis a woman was run down and dangerously hurt by an automobile, owned by a millionaire tobacconist, and although he was arrested he was subsequently released. It appears that the driver is reported to have had his car in control, when a woman stepped off a car and stood in the street talking with her husband. Then she suddenly turned and started for the sidewalk, but went directly in front of the car. The car owner says he did not expect the woman to to cross in front of it, and she was knocked down, breaking her shoulder blade, two ribs, a bone in her right arm, and sustaining other injuries. But the point is, should not a car move slowly enough in a case of this kind so that it can be almost instantly stopped? The custom of not slowing down when some one is crossing in front of a car is altogether too prevalent. We know full well that express wagons and butcher boys seem to delight in clearing the streets of pedestrians, scarcely ever slowing down to permit a person to get out of the way, but such vehicles and drivers should have a monopoly of this custom. It is far better for the automobile driver to slow down so that no one will be injured even though they get jostled, than to go tearing through the streets blowing their horns and feeling confident that all will in some manner get out of their way.

AT GRADE CROSSINGS.

It is the custom for horse drawn vehicles and pedestrians to either go so slow when approaching a railway track that they can easily learn if a train is near, or else stop altogether and look both ways before crossing. But certain car drivers ignore any such bothersome habit or precaution. Are they not in a car that will run 50 miles an hour? And is it not nice to go through the country as if one were shot out of a gun? Besides, they are always in such haste to get there—somewhere or anywhere. And what is the result? Accidents are being reported every day as a result of neglect to determine if a train is near when about to cross a railway track. In fact, during the past month more persons have been injured from this cause than almost any other. The following is an illustration of many other similar cases:

A car was heading for New York city recently and was bounding down a slight grade towards the West Shore railroad crossing. It was almost upon the track before some one in the car shouted: "There's a train!" The locomotive crashed into the car and crushed it to pieces. One man was killed, another is likely to die, and four others are severely hurt. It is generally understood that the prime cause of so many accidents of this kind is due to a disinclination on the part of chauffeurs—and of drivers who do not consider themselves chauffeurs, as well—to make a dead stop, shift the gears and make a start thereafter, especially in case the crossing is approached with an up grade.

Of course there should be no such thing as a grade crossing. Possibly it was necessary to have them at first, or go without the railroad, but they should have been abolished long ago. Possibly these new perils may hasten the day for doing away with them altogether.

LESSONS IN COURT CASES.

A Fair Verdict.—The verdict of a Kentucky jury on conflicting evidence that an automobile ran into a bicyclist was sustained, and $500 was not an excessive verdict where a knot about the size of a goose egg was formed in the boy's side. It was contended that the verdict was the result of prejudice; but in reply to this the court said that if so, the prejudice was created by automobile owners running away and leaving their victims to care for themselves. The excuse given in this case for not stopping the machine—that his sister-in-law was delicate and nervous—was insufficient, as his son was an experienced chauffeur and he could have returned personally, which would have largely removed the prejudice, if any existed.

He Was Not Negligent.—Where the driver of a motor cycle in North Carolina stopped his machine in time—150 yards before he met the horse—and the horse shied and hurt his driver while the motor cycle was standing still, it was held that the plaintiff was properly nonsuited as the owner of the motor cycle was not negligent.

Owner Not Responsible.—In the rule laid down by the Appellate Division of the New York Supreme Court the other day respecting the liability of automobile owners there was but one point that was essentially new. The owner of a vehicle is not responsible for damage done by his driver or chauffeur when the latter is not acting in the line of his employment. When a coachman takes his employer's equipage unbeknown to the latter out on a lark and runs over an innocent bystander the owner cannot be made to respond with an indemnity for the injury. The New York Court held that this was so, even though the owner knew and gave his consent to the use of his vehicle by his chauffeur in the pursuit of pleasure or the private business of the latter.

Business Change.

Mr. Joseph Grossman, formerly treasurer and manager of the National Sales Corporation, has resigned from that position to go into business for himself on August 1st. He will embark in the special advertising field, with headquarters in Cleveland.

Prior to his assuming management of the National Sales Corporation, Mr. Grossman was connected with the Continental Caoutchouc Company, and for several years prior to that he was a member of the firm of Emil Grossman & Bro., of Cleveland, and later of New York, publishers of the *Motor Review*, which was purchased by the present owners of the *Automobile*.

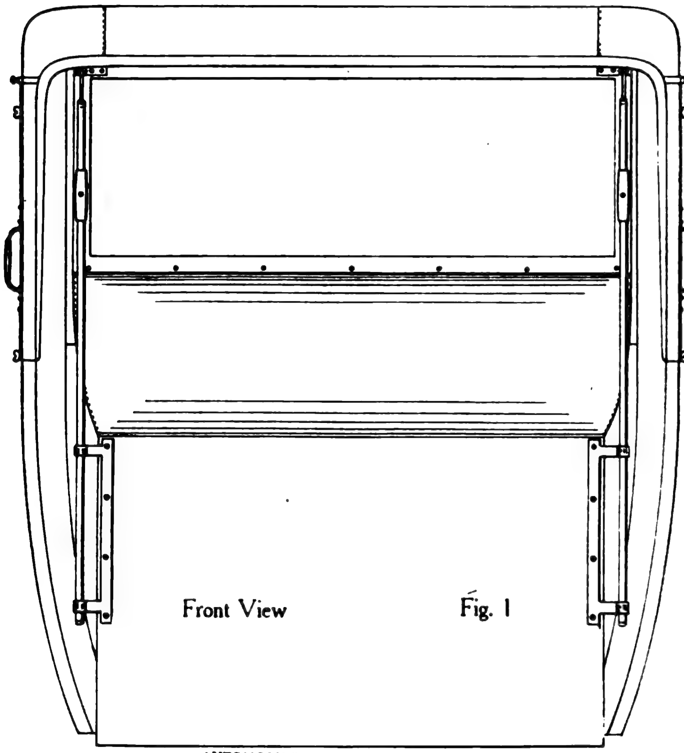
THE REPAIR SHOP

THE EXTENSION TOP.

Points on Its Improvement and Rules for Its Construction.

For some years efforts have been made to improve the American extension top in connection with the landaulet body and storm front. The first start was made with the cape top, which looked well for a change, but when the side entrance came into use the cape top was discarded.

The Mercedes people tried the American five-bow extension top. Five bows were used on account of the extreme length of the body, and to give more length in front a large hood was substituted and secured to the front bow, but for general purposes, while very convenient, it did not suit every one, but a great many were built, and especially in this country.

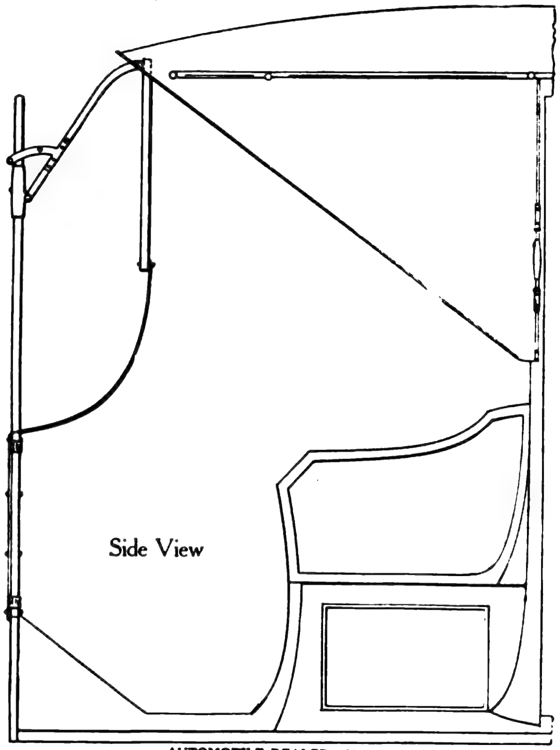


AUTOMOBILE DEALER AND REPAIRER

The next move in top construction was a combination of tops. On the front of the auto was a two-bow extension top, fastened to the front seat as usual, and in the rear a victoria close leather top. The leather of the extension did lap over the front bow of the close victoria top. This practice was one of the best at the time and proved successful. For those who had touring cars with victoria top and wanted protection for the chauffeur, the front part of the extension top was something badly needed and looked well. These tops were made with and without hood. Those without were in the majority because the victoria top was 52 inches long over all, which reduced the length of the extension top by one-half, therefore the slat irons were shifted foreward, making the upper part of front bow nearly on a line with the dashboard, consequently the hood could be dispensed with.

Foreign auto builders, noticing the success of this top construction, improved them and made a combination of extension victoria top all in one and dispensed with the two extension top front bows. This improvement looked fairly well when the top was up, but not when down, as the folding could not be easily accomplished.

In the meantime the Huillier storm front transformation was invented, which accelerated the construction and at the same time improved the extension tops, also facilitating the connection of the storm front with the front bow of the extension top. This new front was first seen last year at the automobile exhibitions, being applied to the very best automobiles, and of such a make and finish that they attracted considerable attention by makers and buyers.

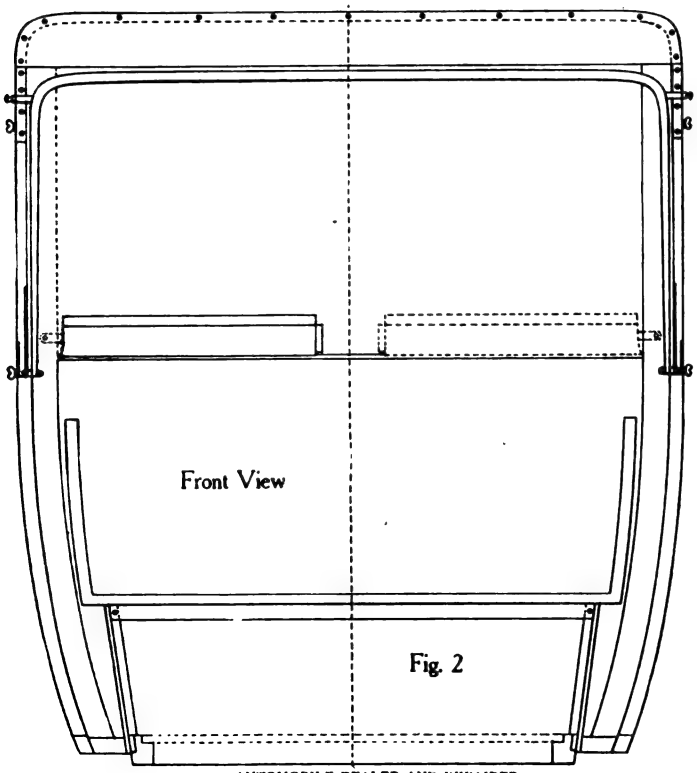


AUTOMOBILE DEALER AND REPAIRER

But with all these important improvements in storm front and top construction, the problem to construct a top possessing the advantages of a closed top body but that might be changed in a moment into an open one was not yet solved. To solve this problem Kellner, of Paris, came nearest to it. He used the Huillier transformation front in connection with a landaulet body, but the coupe pillars in which the glass frames work up and down were stationary, while on landaulets those pillars drop on the fence rail. The front part of the extension top front of coupe pillars is close, leather covered, and has one bow, and the slat iron is about 11 inches above the door fence rail, which gives a very good entrance to the front seat, the front bow not interfering going in and out. The top above the door is the same as an extension top, but the rear part of top is the same as a landaulet top, with full round corners.

The upper part of the doors is of peculiar construction and is known as the Kellner patent, and is the same as a regular coach door, but is cut apart and hinged at the fence rail. If the top needs to be opened, the glass

frames are let down into the door berths and the upper parts of the doors are let down and rest against the inside door trimming. The objection to this is that it is unsightly when the top part rests against the door trimming, and takes away 2½ inches space on each side of the body, which should be kept clear of any obstruction,



as a body of this kind is never too roomy. Besides, the doors must be made a certain height so that the upper door part drops above the rockers. When the glass frames are down the top rails are removed and the front part of the top is carried toward the rear and bolted to an iron each side of the body, similar to a shifting extension top.

The objection to this top is that the upper door arrangement is entirely too heavy and too bulky. The Kellner top drops on top of the back, which is nearly 25 inches high from top of seat, consequently when the top is down the front bow is at an angle of 45 degrees, which is objectionable to an open carriage.

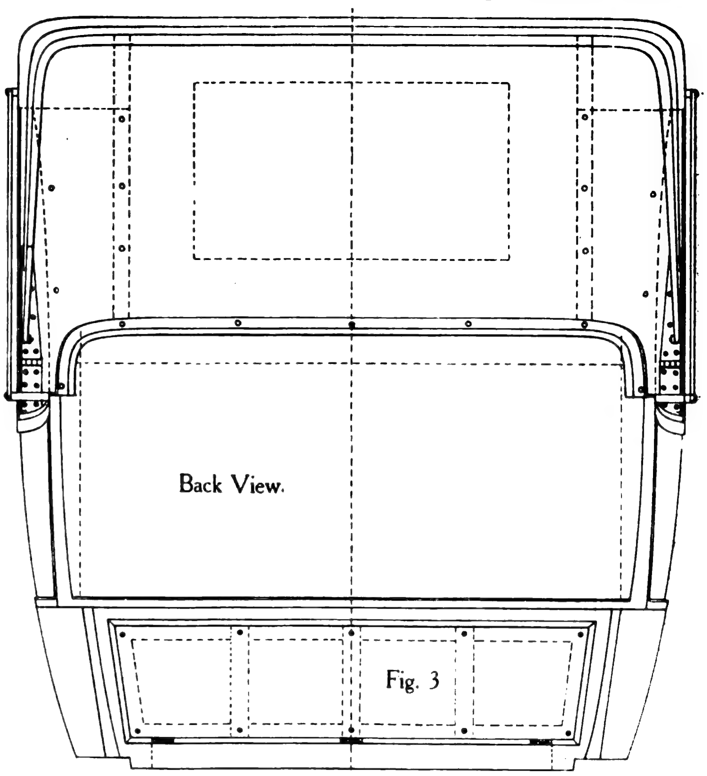
All these objections and shortcomings have been eliminated and the shifting extension landaulet construction has been solved, as illustrated in this working draft.

With Fig. 1 we illustrate the Huillier transformation front. The glass front or the glass frame measures 18 inches in height and a trifle less than 48 inches across. The part below is a leather apron as long as the glass frame and the rest to suit the height of the front bow under which the glass frame rests and must be a trifle above and directly back of the bow. The position of the frame is partly regulated with the levers which are sliding up and down the posts, and its transformation can be put in four different positions.

Fig. 2 represents the front view of body without the top leather, to give the body maker the necessary information needed in its construction. Note the front surface of the front bow in its position on the body; the top has side curve, as shown on the bottom view, therefore this front bow is that much narrower than the coupe pillars, or as much narrower as the amount of contraction toward the front, which gives the round of the body. The top jamb prop is secured back of this bow, and the bottom part is connected with the second bow, which is cut into the upper part of the coupe pillars. The irons on which the front bow is bolted are screwed to the inside surface of the second bow, which has a lap extending forward on each side, to which the front bow is bolted permanently to the second bow, except that it moves around the bolts. The second bow is secured to the coupe pillars with four thumbscrews, two on each side, and if the top is lowered the four thumbscrews are partly loosened, so that the bow can fall away from the coupe pillars, and the same lower thumbscrews serve to secure it to the rear irons, which are on upper rear standing pillars, but the rear top must be laid down first. After that the front glass frame, which moves up and down in coupe pillars, is let down, and the upper coupe pillars are turned down on the fence rail. The left side pillar is drawn in dotted lines when up, and in heavy lines when down, and the right side in dotted lines when down and heavy lines when up. Having two very light bent bows in front makes it easy for two men to shift this part of the top toward the back part.

The construction of the doors is exactly the same as the landau or landaulet door, where the glass frames are held up with flappers, but on this body there is no top rail and the glass frame must not be higher than the bottom edge of the top leather. To make it partly waterproof a pocket is sewed to the top leather, turned one-half inch above the glass frame and down back of the glass frame. There must be one-half inch space between the top edge of glass frame and the pocket, so that when the frame is lifted over the fence rail it must have sufficient space on top. The strong hinges on the coupe pillars keep the top always in a vertical position.

The rear upper door pillars are spliced to a bow, which are on this draft ⅞ inch thick. The tops of these door

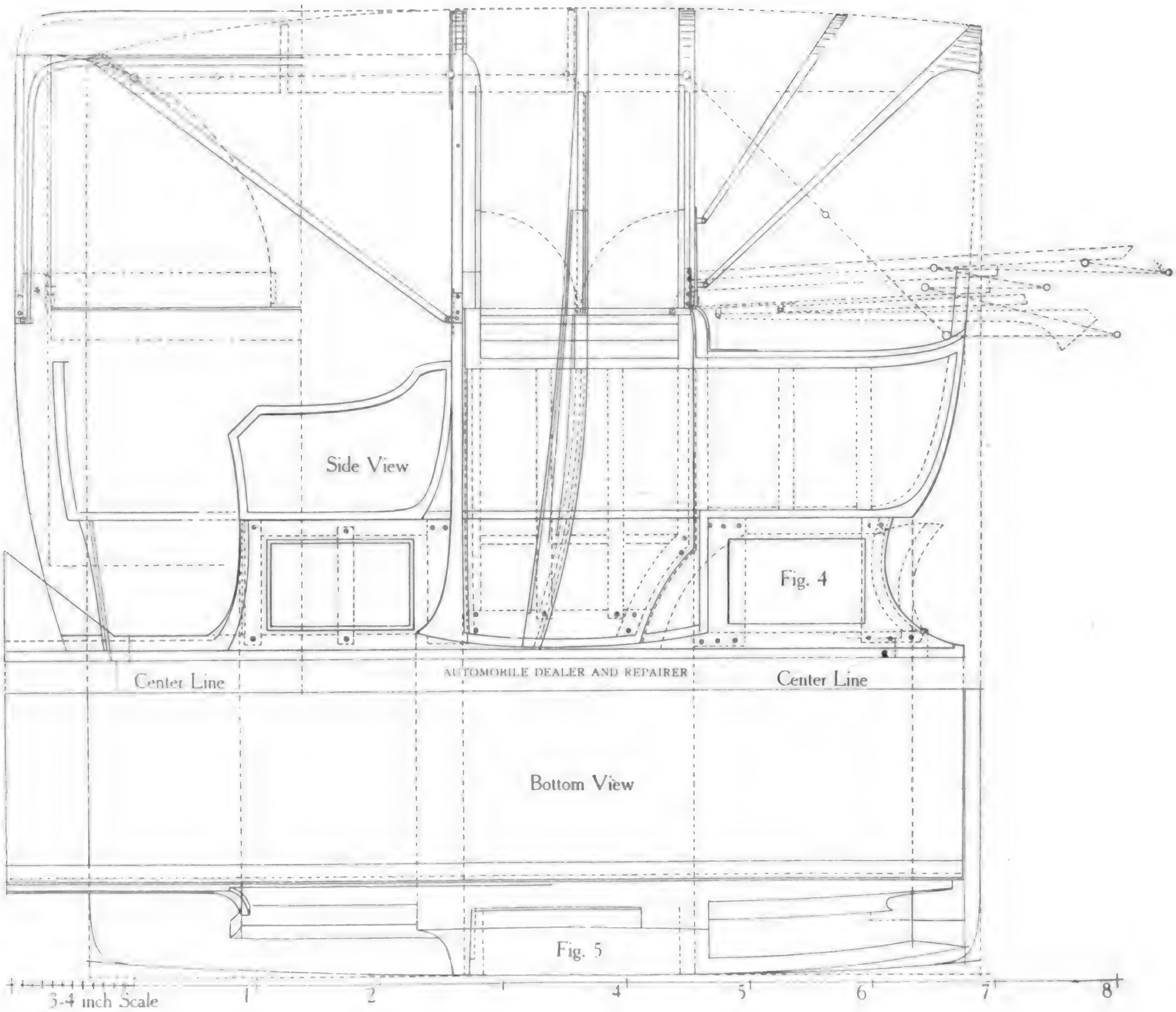


pillars are 1¼ inches, which of course makes an offset of ⅜ inch on each side, but as this part is trimmed over with the head lining the trimmer is able to make a good finish.

These upper rear door pillars, including the bow, are hinged to the standing door pillars with two good-sized

hinges; the two rear bent bows are secured to the same hinges. The two irons, one for each pillar, to which the front top part is bolted, are best seen on the side view and are level with the door flappers, but when the top is down it turns up, following the dotted line.

Fig. 3 is the rear view and gives practically all the information needed by the body builder. It gives the widths of the rear part of the body, the hinges, top joints, the widths and shape of the two bent bows and also the contraction of the rear bow to meet the curve of the top



on the sides. The dotted lines indicate the back stays, size of back curtain and how it laps over the back stays, and also the size of the celluloid light.

In the side elevation and bottom view, Figs. 4 and 5, are found all the details mentioned in Figs. 2 and 3, but more concentrated for working purposes. It will be noted on this draft that the widths on the door pillars are alike, but this is not positively necessary, and the body could be made narrower across the coupe pillars and the top narrowed up in proportion.

Note also the two irons, between front and second bow and between the door, to hold the top leather up. These irons are $\frac{1}{8}$x$\frac{3}{4}$ inch and are riveted on both sides to the top leather. They do not take up much space and are stiff enough to hold the leather in the correct position. This should be a close leather top front and back and glass frames should be mahogany or rosewood.

IGNITION TROUBLES.

How to Locate Them and How They May Be Corrected.

BY SYDNEY F. WALKER.

(Continued.)

The testing of the jump spark system is very similar up to a certain point to that of the make and break. In the jump spark system, it will be remembered, and as shown in Fig. 2, there are two complete circuits, known as primary and secondary. In the make and break system there is only one circuit. The primary circuit consists of the battery, the primary or thick wire coil of the induction coil, the contact breaker or buzzer, and the commutator or contact maker. The secondary circuit consists of the secondary or fine wire coil, and the sparking plug. In both circuits, earth, or the frame of the machine, forms a part of a circuit. In the primary circuit, the current passes from the shaft *M* to the screw *B* by way of the frame of the machine, and in the secondary circuit it passes from one wire of the sparking plug to the terminal *B* also. Commence by testing the primary circuit through, and in exactly the same manner as the make and break circuit was tested. The ammeter may be inserted at any convenient point, say at one end of the

battery Q, and when the commutator is turned round, and the segment P comes opposite the spring X, a current should be shown on the ammeter, and in addition, the contact breaker on the coil, the buzzer, should commence to tremble. The office of the primary circuit is to magnetize the core of the induction coil, and the office of the contact breaker is to break the primary circuit after the magnetism of the core has been established, in order that the secondary current may be set up. The primary circuit may be tested, if time presses, and providing that nothing is wrong with the contact breaker, by merely turning the commutator round until the segment P makes contact with the spring X, and keeping it there. If the contact breaker commences to buzz it will be pretty clear that the primary circuit is all right. On the other hand,

FIGURE-2

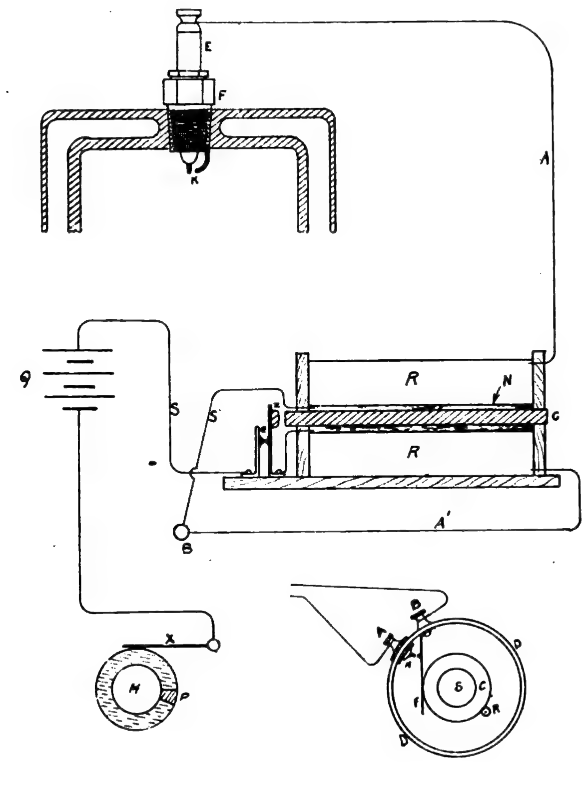


FIGURE-3

if it does not buzz it is a pretty safe indication that something is wrong with the primary circuit.

Test the battery, cell by cell as before, with the volt meter and the ammeter, and then having connected the ammeter in circuit, the remainder of the primary circuit can be tested either by the aid of a short piece of wire bridging over successive portions of the apparatus and connections, or by the aid of the volt meter. If the ammeter is connected in the circuit next to the battery and between the battery and the spring X, a wire attached to the terminal of the spring X may be successively touched upon the screw B, the spring carrying the contact block Z, the spring carrying the other contact E and the wire S. As before, when the cause of trouble is passed over a current will be shown in the ammeter. In addition, a further useful test may be made by temporarily holding the contact spring so that the contact breaker cannot break the circuit, and with the primary circuit then complete, say by connecting the spring X with the terminal B by a short piece of wire, testing the magnetism of the core of the induction coil. This is one of the points in which practical experience will come in and will be so useful.

The man who has the ignition outfit repairing in his hands should take every opportunity of making tests upon induction coils that he knows are sound. Thus on an induction coil that is doing its work properly it is quite easy to temporarily complete the primary circuit so that a current passes continuously through the primary wire of the induction coil, and then to test the attraction of the iron core for a small piece of iron at the opposite end of the core. It should be mentioned that wherever an electro magnet is employed, as in this case, tests of the pull of a certain sized piece of iron will be found of considerable service. In this case the attendant might make himself a cube of wrought iron or mild steel of any convenient size, say half an inch in the side. The testing piece need not be a cube, and it need not be very exact, though the indications will probably be more delicate and will tell him more about different coils, the more exact they are. In the center of one face of the cube he might drill and tap a small hole and screw in a small eye, and to this eye he might attach a piece of ordinary sewing cotton, which he can either fix in any position or hold in his hand so that the cube is suspended opposite the end of the core of the induction coil. He will find that the magnetism in the different cores of different coils varies very considerably, and incidentally he will obtain a considerable amount of information as to the construction and the relative values of the different coils which pass through his hands. With a well-made coil and with good iron in the core and everything else in order, there will be a certain distance at which the cube of iron is definitely attracted. He can measure the distance with his foot rule. In a short while, when he has tested a few coils, he will be able to judge by his eye. Having this information, and in particular having it for coils of different makes, when one of them passes through his hands a test of this kind will tell him if there is another trouble to which coils, particularly cheap ones, are subject, viz., the breakdown of the insulation.

The tests made with the volt meter on the make and break apparatus may be made upon the primary circuit in the same manner. Thus the bared ends of the volt meter testing wires may be pressed one upon the terminal X and the other upon some portion of the wire S, then upon the screw of the contact breaker to which S is attached, then upon the spring holding the rear contact, then upon the front contact spring, then upon the screw holding the end of the primary wire, then upon the terminal B. In each case clean places must be made for the test wire to be brought into connection with, and the ends of the testing wires must be pressed firmly upon these places. As before, the indications of the volt meter will be slightly decreased, as more and more resistance is put into the circuit.

(To be continued.)

Tire Valve Nuts.

At the foot of each tire valve and inside the rim is a thin nut, which grips the tube and prevents any leakage at this point. These sometimes slack off, and the tire will leak unaccountably when under pressure. We recently had a tube returned after repair in which this nut had become loosened, causing a considerable amount of trouble until the cause was located. In another case a new car was delivered with all four tires and also one on a detachable spare wheel suffering in this respect, and it was not for some time that the cause was located. The remedy, of course, meant removing each tube, all of which could have been saved if the tire maker had screwed these nuts up properly, or if the fitter had examined them before fitting.

FACTORS IN REPAINTING.

Study the Inclinations of the Customer—Color Novelties, Details, etc.

BY M. C. HILLICK.

The jobbing shop automobile painter, to win and retain trade that is well worth having, should especially study the inclinations of his customer, and, to some extent at least, patronize his whims.

In the matter of colors, for example, there are numerous novelties which, while not departing far from those denominated standard by the rank and file of users, are at the same time sufficiently distinct in their individual characteristic to prove exceptionally attractive. Trick these colors out with original lines or bars of relief color and the scheme rarely fails to elicit admiring comment.

All such color schemes should, of course, be varied repeatedly, or even up every job to the extent of making it distinctive from the one preceding it or from the one to follow after. Naturally, there are some people who will want their automobile painted just like So-and-So's, and in such cases it is a matter of business, if not of inclination, to follow instructions. As a matter of fact, this is always policy, with certain reservations. However, as a rule, the average owner of the horseless carriage is ready to accept expert suggestions from the painter in reference to color schemes and other details of painting and finishing.

Deep reds, carmine and maroon are deservedly popular repainting colors for touring cars to be used practically the year round. On the whole they are easy colors to apply, and the tone may be varied enough to give each individual job, if so desired, a distinct and separate color. If the variation is not made in the body color it may be made in the striping or relief pigment applied. Again, if the variation is not made in the body color it may be wrought in the color for the chassis.

In repainting the automobile, regardless of the colors selected, all details of the work, from the first applied process to the last, should be faithfully carried out. Upon the automobile as upon no other vehicle, attention to details—even to the minor niceties—count immensely with the owner, who generally is nothing if not a stickler for the little, and to many of us unimportant, details.

It may happen that to carry out some of these details the painter is, for the time being, the loser, but ultimately, as a rule, he profits thereby. This profit may never come to him directly out of what the job in hand nets him, but in ways that are influential and potent, if not plainly direct, he will receive his reward.

With the march of the seasons, the finish upon the automobile, whether new or old machines, has been improved, until to-day the painter who expects to command and retain business must prepare to furnish a finish strictly beyond censure. The automobile is a big vehicle and it invites a big finish, with a depth and lustre unsurpassed. And when this finish has been applied, and men unite in saying that "it is good to look at," then comes the touching up, the whipping into presentable shape, of the parts which, unattended to, give the machine an uncouth and ragged appearance. Many of these minor matters are to be found upon the chassis, and represent nuts, bolt heads and parts of the vehicle not reached conveniently, but, like the sore thumb, are always in the way of keen-eyed inspectors.

Possibly the automobile carries a top, and if so this part of the machine should be cleaned thoroughly and put into presentable shape by the application of a dressing, or otherwise, as the individual requirements of the case may necessitate. Top joints usually require fixing up some, and especially upon the automobile they should not be neglected. Such joints, if necessary, should be scraped and made smooth through glazing with putty, after which, in due time, they can be sandpapered down, coated up with color and finished with a couple of coats of varnish.

All such items have been attended to with great zeal by the carriage painter bent upon making his business a success, and they must in like manner, and to a like degree, be attended to by the automobile painter if he would survive and enjoy the opportunities which the horseless carriage is daily affording him.

A GENERAL BUSINESS.

Sometimes Repairing, Renting, Storing and Selling Are Combined.

There are often chances to rent motor vehicles for one hour, two hours, five hours, all day and perhaps for a week or a month. Not infrequently the repair man does quite a little business in the line of renting cars, just the same as he does a little storing of machines when required. The sign in front of his shop may read "Motor Vehicle Repairing," and nothing may be suggested concerning the renting or storing of automobiles. There are few repair men who do not have excellent opportunities to rent and sometimes sell new and old machines. The repair man is constantly in contact with people who

GARAGE
RENTING & REPAIRING

are interested in autoing, and some people invariably buy a machine only after they have used it on rental or given other means of trial for quite a little time. Almost any of the repair men can tell you how So-and-so hired such-and-such a car for a week's tour in the country during a vacation spell. That he fell in love with the car during the week's use and finally determined to possess it and therefore bought it.

Occasionally a car owner knows that his car needs a thorough overhauling. He is aware that the expense will be from $25 to $50. He is not overanxious to use his machine every day, and perhaps not for a week or two. Maybe he is going off on a business tour by rail, and as soon as have his machine idle he turns it into the repair shop with instructions to make needed repairs and then rent the machine out. The repairs are made in a few days. Then another party who is on his vacation, or who wants an auto trip, comes along and wants to rent a machine because he does not own one. He has enough money to rent, but not to buy. The repair man furnishes him with the abovementioned car at a contract rate. The car is returned in due course and the money paid. The repair man deducts the charges for repair and the commission on the rental. Then he runs over the car once more, fixes a few things, cleans the car up and is ready for the owner when the latter comes. There is often quite a balance of cash for the owner. Anyway, the rental system usually brings in ample cash to pay for a new tire or other needed repairs and alterations.

Furthermore, there are cars on which the repair men get "stuck." The owner is unable to pay the charges for repairs, and the machine is held. Occasionally, with the consent of the owner, the car is rented out by the hour or day until the repair account is earned.

Then machines get left on the repair men's hands. One would be surprised to learn to what extent this is carried. Sometimes a man who owns a machine is called to some

other part of the country. He expects to be gone a week. He leaves his machine with his repair man. The week passes and then the month. Sometimes the repair man can get no word from the owner of the car. The car occupies space and space is valuable in any shop. The storage bill is running up. Therefore the repair man has been known to take it upon his own shoulders to make the machine earn its board and lodging by renting it out. I know of cases in which the cars were never called for. In one case the owner absconded because of other troubles in the town and the repair man still has the machine and the machine is earning its way through the rental system.

The repair man is not supposed to have an elaborate rental system. In fact, some of the repair men simply send the car out, guess at the time, and pocket the money when the car is returned, and that is all there is to it. But it is better to run a card system. We cannot assume that the busy repair man will keep ledger accounts, with his hands soiled in his work setting and fixing machines. But he can run a card system. These cards can be printed on common shipping tags, with space for the name of the party to whom rented, also space for time of return and cost, with condition. There are often a number of complaints worthy of record. Grating sounds may have been heard. A box may have heated. A pipe may have leaked. Memory don't go very far in the busy repair shop. Hence it is wise to get the information from the renting party and chalk it down on the card, and this card is the middle one of the group and can be removed at partly cut lines and filed at the office. Then the list of repairs needed is based on the complaints. The repair order card is at the right and this will go to the repair department attached to the car. Hence the first card carries all that is necessary to determine the financial part, the second card the record of complaints of the parties who had the car out, and the third card the line of repairs needed to put the car in order.

Every repair man gets a number of unusual calls about holiday times. There may be a July 4th celebration, or there may be some great event in town for other reasons. The repair man fixes up one or more idle cars with rows of seats and the renting party gets his fifty cents or one dollar per seat for each passenger, and the repair man gets a good figure for the use of the car.

Real Sight Feeds.

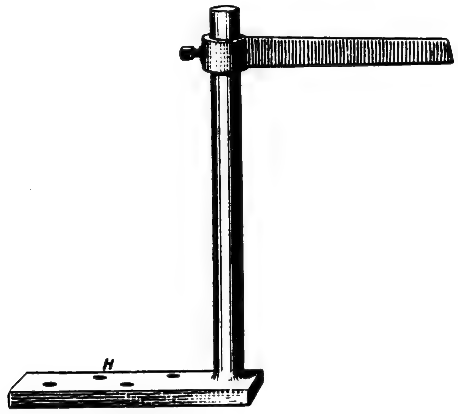
The function of sight feeds is to enable the driver to tell at a glance whether the lubricator is working properly. In many cases, however, a row of sight feeds is so located that it is impossible to see what is going on in it except by close inspection when the vehicle is standing still. Very often a strip of white cardboard behind the feeds will make the matter much easier, and, in fact, there are several lubricators on the market whose makers have grasped this idea, and furnish a white enameled metal strip, which is screwed to the dashboard behind the sight feeds.

Selling Points.

The sale of the automobile of to-day depends entirely on the merits of the car, not on sensationalism, freak construction or price alone. The experimental stages of the automobile industry are over. The typical design, which has proved itself by time, and as only time can prove it, has been adopted. The evolution has been slow, but each year's experience has added valuable lessons.

A Difficult Weld.

From O. J. Hess, Missouri.—For the benefit of others who may at some time run up against a similar proposition, I will tell how Harry DeLay and I welded a four-inch steel axle on a traction engine. First of all, we jacked up the engine to take the weight off the wheels. Then after taking off the boxes on the axle and cutting off the collars, we took the differential gear and pinions off. We then pulled the wheel and axle out of its bearings with a differential block, getting our pull from a post set for that purpose. Next thing was to get the key out of the hub, and finding we could not start this key, after bending a key drift several times, it being made of 1-inch cast steel, we drilled the key out. For drilling this key out we used a ratchet and drill post, more generally called an "Old Man," as shown in Fig. 1. This Old Man is made of the following size: Base ⅝x4 inches, 12 inches long; upright 1½ inches round mild steel, 18 inches high. The arm is 1½x⅞ inches, 11 inches long from the center of the eye. The base has several ⅝-inch holes, *H*, drilled through it, to bolt it to the work. The arm can be raised or lowered, and swivelled in any direction, enabling you



A DIFFICULT WELD. FIG. 1.

to bore a hole anywhere within a 20-inch circle. The Old Man was bolted in this case to the hub at *A*, Fig. 2.

We then put a chain between the spokes and over the back of the hub, and over a jack screw, as in Fig. 2. *B* in Fig. 2 is an iron ferrule smaller than the axle, which we had to put between the jack and the end of the axle, so as to throw the head of the jack outside of the depression in the hub, on account of working the lever in the jack. Then we screwed the jack as hard as we could with a ⅞-inch cast steel lever, 3 inches long, and jarred the hub at the back with a set hammer and sledge. But yet the axle did not move. We then got two gasoline torches and one plumbers' hot blast torch and heated the hub pretty warm, tightened up the screw, and jarred the hub with the set hammer and sledge, and it finally moved, and we pushed the axle out with the screw. We then hauled the axle to the shop and took careful measurements of the collars, shoulders and length; put the longest part of the axle in the forge with a No. 400 Champion blower, and started to heat it. Meantime, in another force I prepared a section 1 inch thick and 4 inches in diameter, and welded a ¾-inch porter bar on this section. The axle was now nearly hot, and when it was at a proper heat we got it into the anvil, bringing the 1-inch section from the other forge, and welded it on to the end of the axle, cut off the porter bar and punched a hole into the end of the axle for a 3¼-inch dowel pin. We then heated the short end of the axle and punched a similar hole in the end of it, both of these holes being slightly convex, so when we put in the dowel pin and batted them together in the fires they touched only at the center.

Previous to all this we set a hole in the ground at the proper distance from the center of the fire, set a wheel horse against the post and laid an anvil on the top of the wheel bench, so that the end of the long part touched the anvil on the wheel bench on the other side of the forge. We swung a steel rail about 5 feet long to use as a ram. Then we raised a heat, and when at a good white heat, and using plenty of sand as a flux, we began to swing the ram on to the end, keeping up the blast and turning

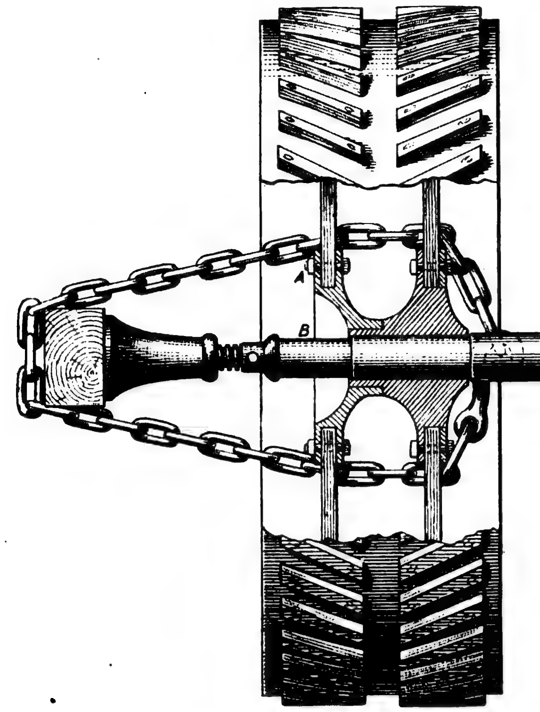


FIG. 2.

the axle in the fire all the time. I had a nice clean fire and could see my weld all the time. It began welding at the center, and when it was closed up on the outside, we stopped the ram and smoothed up the joint in the fire with a hand hammer. We then brought it out on the anvil and forged it down to size, and when cold it rang like a bell. It took just twenty-five minutes from the time we put it on the fire to bring it to a welding heat on the No. 400 Champion blower. I will say to any repair man needing a blower, get a No. 400.

Non-Skids for Small Cars.

A reader writes that he does not favor non-skids for small cars, claiming that the two-seated car is not very prone to skid, and says that if the driver be a nervous man and does not care to dispense with them they should be of the detachable order on the score of economy. He adds:

"The usual comparison between a steel armored and a plain rubber cover is that if a plain rubber tread will last 6,000 miles, a metal armored tread will only last 4,000. This may be true of larger cars, but I have found that whereas 6,000 miles is not an exceptional life for plain rubber covers on the rear wheel of a 6-h. p. two-seater, 2,000 miles is about the average life of an armored non-skid on the same car. Considering that out of the 6,000 miles probably not more than 500 are driven on roads which could cause any anxiety, the constant use of permanent non-skids would be gross extravagance, and consequently I limit my choice to the various detachable types, such as chains, or the complete loose armored treads, or the half-dozen little tie on studded gaiters, any of which may be carried in the tail drawer. And naturally my preference is given to those devices which are obviously the more portable, storage capacity of such a car being so limited."

We are inclined to think that our correspondent's estimate of the comparative wearing qualities of plain rubber covers and non-skids is far from the fact. Possibly some reader has made such tests as will make the matter more conclusive. If so, we shall be glad to hear from him.

A LOOSE FLY-WHEEL.

It May Cause Knocking—How to Tighten the Wheel.

Knocking may be caused by a loose fly-wheel. This does not often happen with fly-wheels that are bolted to a flange on the crank shaft unless the bolts have been very carelessly fitted. Fly-wheels fitted in this way must have the bolt holes accurately pitched and reamered out with the wheel in position on the shaft, so that the turned bolts to be used in securing the two together shall be a fairly tight fit. Where proper care is taken here and the bolts are screwed up tight with stiff spring washers un'er the nuts, or the points of the bolts well riveted over, there is little probability of any looseness occurring.

Fly-wheels that are keyed to the shaft are more liable to come loose, and the knocking they set up is very loud, particularly at any variation of the engine speed. These fly-wheels are generally fitted on a tapered end of the crank shaft, in which a key is sunk, and are forced up in place by a nut on the end of the shaft. In setting out to rectify any looseness at this point, begin by removing the key from the taper of the shaft, and then, after filing down any burrs that may have been raised, try the fly-wheel on the shaft to see if the two tapers correspond. Any slackness that can be felt by hand shows a considerable amount of error, and will probably necessitate a truing up of the parts in the lathe. To ascertain more accurately the relative condition of the two, rub the taper of the shaft thinly with red lead, then place the fly-wheel on it and turn a few times before lifting off again. On looking into the bore of the fly-wheel, the points where the shaft bears will be shown by the marking, and similarly an examination of the shaft will show where the fly-wheel has been bearing on that, and, if there is any want of circularity or variation in the two tapers, the parts must be mounted in the lathe to be machined accurately to each other, as they will never remain tight unless the tapers correspond. When trying the fly-wheel on the shaft in this manner, the shaft must be held vertically or the marking will all show on one side.

It then remains to fit the key, and the first step is to find if the key-way has been worn or distorted in any way. The most satisfactory way of accomplishing this is to lay the shaft in a pair of V blocks on the surface table with the key-way on the horizontal center line. The surface gauge can then be used to see if the sizes of the key-way are parallel with the shaft. If out of truth in any way, it must be trued up again and the fly-wheel tried on it, so that any discrepancy between the two key-ways may be noted, and, if possible, marked on the bore of the wheel by means of a scriber having a point bent at right angles. After truing up one key-way, discrepancies are sure to exist, and must, of course, be removed so that the sides of the key-way in the shaft will lie perfectly true with the sides of that in the boss when the wheel is in position.

If the key-way is too small to admit of a scriber being inserted to mark a line on a bore of the wheel, the latter may be placed with its periphery resting on the surface

table and the key-way on the horizontal center line, small wedges on either side serving to keep the wheel steady. In this position the surface gauge may be employed, as in the case of the shaft, to mark off the lines for the sides of the key-way, the width between which must be obtained by accurately calipering the key-way in the shaft. A machined key, having its four sides at right angles to each other, is then fitted tightly in the shaft, and, if the job has been carefully done, the key-way in the fly-wheel will also fit. These machined keys can be purchased in all sizes, and save a great deal of work.

Before screwing the wheel hard up, make sure that the top of the key is not bearing against the bottom of the key-way in the boss. In every case where the key is a fixed one, or a feather, as such a key is often called, it ought to have a very slight amount of clearance on top.

A Weak Spark.

It sometimes happens that the motor will run well with the throttle partially closed while the car is standing still, but will miss explosions when the throttle is opened and the car is started with a load of passengers. In such cases it is often true that the batteries are weak, and that there is a "leak" somewhere in the coil or secondary wiring, or the points of the plugs are too far apart. The compression in the cylinder is increased when the throttle is open and a greater amount of electrical energy is required to force a spark across the points of the plugs. And while it may happen that a sufficient amount of energy is available from the battery and the resistance of the "leak" in the secondary circuit is great enough to enable the spark to jump across the plug points at reduced compression due to the partial closing of the throttle, there is not enough current available to produce a spark at maximum compression. Of course, as the compression is increased the amount of electrical energy necessary to force a spark through it across a given distance is correspondingly increased. The remedy is to switch on a new set of batteries, or if they are not available, to bring the sparking points of the plugs slightly closer together.

CLEANING THE MUFFLER.

Thanks among other things to the design of silencers, as now fitted to up-to-date cars, modern automobile engines are almost noiseless, but to effect this quietude, the interiors of these organs being somewhat intricate, much surface is offered to the impingement of the gases, with the result that the passages for the exhaust unsuspectingly become more or less choked. This is often the reason that an engine which originally kept cool enough shows a tendency to heat up, and, after every cause but this being sought, the undesirable tendency will disappear upon the cleaning of the interior walls of the muffler. It is necessary to detach the muffler and to get rid of the deposit by scraping, although a temporary riddance may be obtained by striking the exterior of the vessel smartly all over with a mallet. This will jar off a good deal of the deposit, which will presently be blown out with the exhaust.

It is a good plan to wash out the brakes with gasoline once in a while. Sufficient oil may accumulate in them to prevent them from working at a critical moment.

A simple test of gasoline is to pour some of it on a piece of blotting paper. The more grease remaining after the gasoline evaporates the poorer the quality of the fuel.

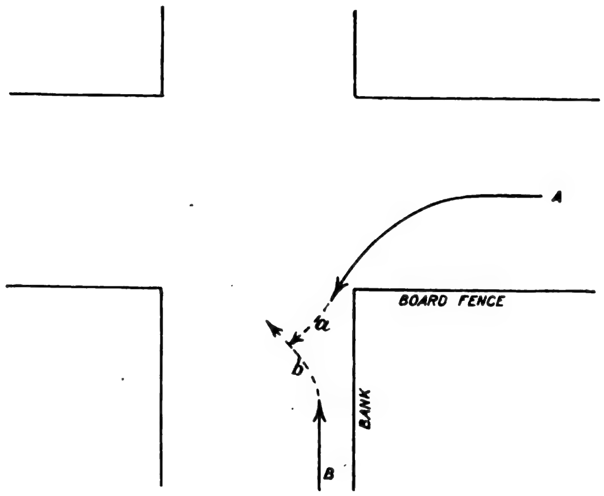
TROUBLE DEPARTMENT.

Under this head are questions and when possible, replies to them. Our readers will appreciate the importance to inquirers of furnishing the desired information promptly.

This department is intended to be a "trouble clearing house," and it will be esteemed a favor if our readers will add information to it from their own experience or knowledge.

Careless Driving.

From H. Prodhomme (No State given.).—To decide an argument, will you reply to the following: A cuts the corner with his car in such a way that B, coming in the opposite direction on the right hand side of the road, cuts



over to the left to save himself, but he does not succeed in getting out of the way, and the consequence is a smash-up. Can B recover? The enclosed diagram will show what we mean.

Reply.—In a suit at law we think B could recover. When making a turn to the left at the intersection of two streets or roads, it is often the custom of ignorant or careless drivers to cut across before reaching the center of the intersecting street or road. This is a most exasperating custom, and whenever an accident occurs from it, we believe the offending party should be brought to book in order to teach a lesson to him and to furnish an object lesson to others.

Better Buy Than Build.

From James S. Smith, Iowa.—I am thinking of building a gasoline engine to drive an automobile suitable for two persons, not running at great speed. What should be the size of the engine and about how many revolutions?

Reply.—Use an engine with a cylinder 4 inches in diameter and with a 5-inch stroke. The maximum speed would be about 500 revolutions per minute, and the engine would be about three horse-power. But unless you are building engines all the time, or like to experiment, it would be far better and cheaper for you to buy than to build.

Chain and Sprockets.

From Frank Scarrett, Texas.—What should be the size of a chain for driving an automobile weighing about 1,700 pounds and using a 12 horse-power engine, and what should be the size of the sprockets when driving the rear wheels direct from the engine on the fast or direct connected gear?

Reply—Use a roller chain having a $1\frac{1}{4}$-inch pitch, and 8-tooth and a 26-tooth sprockets.

Automobile Designs.

From James Whittaker, Kentucky.—Can you tell me just why most cars are made with such long wheel bases and why manufacturers seem to vie with each other in making them as ugly in contour as possible?

Reply.—Long wheel bases do much to increase the comfort of those riding in the car. It gives it greater flexibility and reduces the shock. Much thought and study have been given to body design, and convenience and adaptability considered, possibly the general appearance of the present design should not be the subject of severe criticism. Whether the present external appearance is to be permanent is a question that it is not safe to answer.

Gasoline Consumption.

From H. L. Kingsland, New York.—I have a 10-12 horse power car that weighs about 1,700 pounds loaded. The best I can do is to get on the average about sixteen miles to a gallon of gasoline. It seems to me that this is less mileage than it should be. If others do better I should like to know how they do it.

Reply.—Probably the roads you use are not the best, and with this consideration you are not doing so badly. We should be glad if other readers would give their gasoline averages, stating the size and make of their cars. Gasoline and oil consumption are important considerations that many car owners and drivers have not yet fully mastered.

Too Much Oil.

From M. W. B., New Hampshire.—I have a light four-cylinder runabout and it will not run 100 miles on a gallon of lubricating oil. It seems to me that this is too much. Am I right?

Reply.—Most assuredly there is a waste somewhere. You should be able to get from 200 to 300 miles from a gallon of oil. Possibly your rate of feed is too high, and possibly there is a leak somewhere.

In Touch With His Car.

From Dr. H. S. Liddle, New York.—Your paper seems very practical and not flooded with advertisements. I for one would rather pay more for practical reading, especially along the line of practical hints on road and in shop.

I hope you will continue your "Accident Department." It is very important and in many ways.

Too much space can hardly be allotted to "The Repair Shop" and "Repairing."

Some people take pleasure in picture taking and overlook the pleasure of plate developing, and so with the automobile. Many do not see the pleasure and twofold profit of personal attention, which brings them more intimately in touch with their car.

Oxidizing Iron to Prevent Rust.

Those who desire a fine gunwork finish to automobile parts may secure it by the following method: Prepare in a glass jar a mixture composed of 200 grammes of perchloride of iron and 200 grammes of very fine iron filings, perfectly washed and free from grease. Then add 100 grammes of sulphuric acid and stir together. The precipitate formed by the chemical action when the mixture settles is employed for oxidation. With the aid of a sponge or pencil brush made of spun glass the precipitate is spread on the part to be oxidized which has been previously cleaned. The part to be oxidized is then heated in a steam or vapor bath, and afterwards dried in hot air. The piece is then left in boiling oil for fifteen or twenty minutes, and afterwards cleaned.

A Severe Test.

What many people would consider a "cruel and unusual punishment" for a motor car was recently given one of the Chalmers-Detroit demonstrators by Joseph Tracy, a well-known consulting engineer of New York.

Mr. Tracy was brought to the factory by Carl H. Page, a New York dealer, who, before taking on the Chalmers-Detroit line, wished to give the new "30" a thorough test. At Mr. Page's request a car was turned over to Mr. Tracy and for two hours he gave it the severest road test an automobile could be asked to stand.

With spark well advanced, he gradually applied the emergency until it was wide open. Then he gradually applied the emergency brakes until the car was brought down to a slow pace. With spark and throttle still wide open and emergency brake set he drove the car several miles till the heat of friction burned the paint off the brake drums, and finally the wheels locked. This test was designed to test the clutch for slipping, the brakes for holding power, and the propeller shaft for strength under unusual torsion. It also showed the strength of every part of the driving mechanism. Score, perfect.

Next Mr. Tracy opened the needle valve of the carbureter one full turn more than the adjustment at which the motor has been found to run best. Upon the rich mixture thus obtained he drove with low spark and full throttle, endeavoring to heat up the engine. Again the "30" made a "perfect score." The engine wouldn't heat.

The third test was intended to show whether the "30" would "load up" with gasoline. The car was driven at full speed. The spark was then retarded, the throttle left open, and after a few minutes the spark shut off entirely. If the intake passages ever would "load up," this was the time. But they didn't. After the motor had stopped, Mr. Tracy turned on the spark, and immediately it started up without even cranking.

"She'll do," said Mr. Tracy, and Mr. Page signed his contract for a large number of cars.

A simple test for ascertaining whether an accumulator contains current is to place the tongue on the terminals, when a prickling sensation, but no shock, will be felt if electricity is present.

The hub brake mechanism is a part of the car which seldom receives the lubrication it should, for in some cases it is far from accessible. Oil is required on the pins supporting the brake shoes and upon the bearing points of the cams or toggle mechanism which actuate the brakes.

Put soap in the water in which you test inner tubes. It saves the eyes in looking for bubbles from a very small puncture and will often show one that would otherwise be unnoticed.

Many a slow leak is not in the tire but in the valve, caused by an ill-fitting valve cap. To remedy this put a little soap on the rubber inside the cap and screw on tight. If this doesn't stop it put on a new cap, soaped as before. Never put oil in the cap or valve. Oil rots rubber.

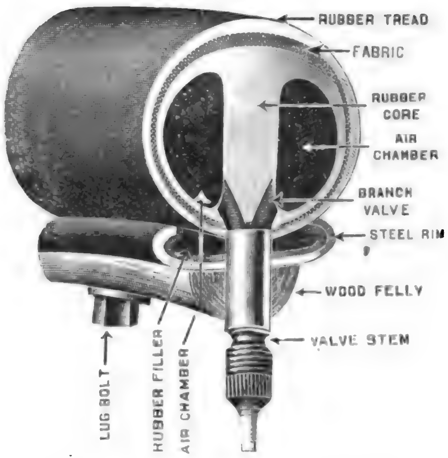
SCIENCE IN SPRINGS.—The Perfection Spring Company, of Cleveland, Ohio, make a specialty of the proper spring suspension of motor cars. Their superintendent has had thirty-eight years experience in designing high grade carriage springs, and in more recent years, springs for automobiles. They manufacture a special type of auto spring, called the "Perfection," which is a combination of two springs in one, a scroll and semi-elliptic member, so connected as to permit the car to ride easy with a light or heavy load. This company has been one of the first to investigate and undertake the successful treatment of "Vanadium" steel for springs, and they have had great success with this particular product. Not a single "Vanadium" spring from their factory has yet been broken. Perhaps there is no better indication of the reliability of the Perfection Spring Company's product than the fact that their factory was running continuously during the recent financial depression, keeping the full force of men at work, and the manager states that the last three months have been the best in the history of the company, both for orders and shipments. E. F. Bunker, of Boston, Mass., for many years associated with a well-known eastern firm in the manufacture of springs for automobiles, has accepted a position with the Perfection Spring Company. Mr. Bunker is well known to the trade, and will have charge of the territory east of Buffalo.

TANKS AND STORAGE OUTFITS.—An excellent underground outfit for a public or private garage is illustrated in our advertising columns. This outfit is manufactured by the Wilson & Friend Company, 316 South Canal street, Chicago, Ill. Only first-class material and workmanship have been put into this outfit, yet the price is very low. The tank is made of heavy galvanized iron connected to the pump with 20 feet of ¾-ich pipe. The pump is made of brass and iron, all wearing parts being made of brass, and it has no leather or rubber packing to wear out. Many of our readers should be interested. Write for illustrated catalogue and mention the AUTOMOBILE DEALER AND REPAIRER.

THERMOID BRAKE LINING.—This material consists of asbestos, rubber and brass, all three of which substances furnish resisting power. Consequently the combination of the three gives not only an ideal braking surface, but adds materially to the strength of the brake band, and it lasts indefinitely. This is said to be the only brake lining made which requires little or no adjusting of the brakes. About 80 per cent. of the high-class cars made in this country will, in 1909, have their brakes lined with Thermoid Lining, and as this material is somewhat more expensive than some others, it would seem that the manufacturers were endeavoring to give the people the best thing possible, regardless of cost. Interested readers should write to the manufacturers of this brake lining, the Trenton Rubber Manufacturing Company, Trenton, N. J., who will gladly furnish free literature concerning this excellent article. In writing them, mention the AUTOMOBILE DEALER AND REPAIRER.

FEAR-NAUGHT PUNCTURELESS TIRE.

This is a single tube tire, as shown, with a center rubber core, upon which the tires run, and two air chambers which are inflated with air by means of an inverted "Y"-shaped valve. When attached to a clincher rim, a rubber filler is used inside the clincher



of the rim, and the tire is secured by from five to eight bolts, which pass through the rim and wooden felloe and screw into lugs in the tire. These tires have been run on an automobile for 500 miles deflated without rim cutting, and the manufacturers state that in four years' use of these tires there is no record of a puncture, rim cut or blowout. These tires can be repaired as easily and in the same manner as a single tube tire, while the center core removes entirely the danger of collapse, acts as a shock absorber and makes the tire speedier and easier riding and free from the danger of puncture. The Fear-Naught Tire is manufactured by Dr. T. J. Cooper, 114 Water street, Paterson, N. J., and interested readers should write him for full particulars, prices, etc., not forgetting to mention the AUTOMOBILE DEALER AND REPAIRER.

FILLEM.—This is the comprehensive name which has been given to a composition for repairing tires. It is made of self-vulcanizing rubber, and can be effectively used for repairing cuts, punctures, curb injuries and sand blisters. The manufacturers state that a repair can be made in one minute without removing tires from the wheels, and such repairs may be executed as effectively by a novice as though performed by an expert repair man. It is also claimed that Fillem prevents deterioration to the fabric by protecting it from grit and moisture, consequently prolonging the life of tires to a considerable extent. If this new invention is anywhere near as good as it is claimed, it would certainly seem to merit an investigation. Any readers who may be interested should write for prices and particulars to the Greenwald Rubber Company, 400 Law Exchange Building, Buffalo, N. Y. In writing do not fail to mention the AUTOMOBILE DEALER AND REPAIRER.

THE KIMBALL TIRE CASE.—One of the best devices on the market for the prevention and repairing of punctures, blowouts, etc., in automobile tires is that manufactured by the Kimball Tire Case Company, Council Bluffs, Iowa. This is a protector constructed of steel link bands which may be clasped around the tires instantaneously. If the tire is completely covered by these claps, it is impossible to have blowouts, punctures, rim cuts or any tire troubles. For a quick repair in the case of a blowout, the invention is handy and efficient. Write for full particulars to the Kimball Tire Case Company, 175 Broadway, Council Bluffs, Iowa, not forgetting to mention the AUTOMOBILE DEALER AND REPAIRER.

SELF-CONTAINED LA COSTE COMMUTATORS.—Since these commutators were offered direct to dealers and jobers in our June issue, they have been distributed largely to all parts of the world. Garages, dealers and jobbers are finding it a paying proposition to sell a timer which shows them a good profit and always gives their customers satisfaction. We refer our readers to the full-page announcement on our outside back cover, and we wish them to note the particularly low prices at which these commutators are being offered to the trade. Send your orders or write for prices and discounts to the Lovell-McConnell Manufacturing Company, Currier Building, Newark, N. J., and in writing, do not fail to mention the AUTOMOBILE DEALER AND REPAIRER.

A GOOD STORAGE BATTERY.—We wish to call attention to an announcement in our columns from Geiszler Bros., 518 West Fifty-seventh street, New York City, who manufacture a non-sulphating storage battery igniter for motor cars. This battery outfit is guaranteed for one year. Size 66, which is illustrated in their advertisement, is six volts and its life is sixty amperes per hour. This battery is sold largely through wholesalers, price of which is $15. Live dealers are wanted to handle the Geiszler products throughout the United States, and many of our readers who are car owners will doubtless be interested. Send for catalogue and mention the AUTOMOBILE DEALER AND REPAIRER.

CRACK UNICUM ELECTRIC HORN ATTACHMENT.—This attachment is manufactured by the Theo. H. Gary Company, 50 Franklin street, New York City, and it is a vast improvement over the old method of sounding a horn by means of a bulb. There is no bulb to be broken and no reed to become clogged. The sound of the horn is loud and penetrating, and continues as long as you press the electric button. The attachment is easily installed, and is operated by the ignition battery on the car. The manufacturers have an interesting proposal to make all responsible dealers and garage owners. Ask for bulletin No. 19 and apply for agency. Do not fail to mention the AUTOMOBILE DEALER AND REPAIRER.

WANT ADVERTISEMENTS.

Under this head will be printed advertisements of shops for sale or to rent, or shops wanted, or situations or help wanted, or tools or machines (second-hand) wanted or to exchange, at the uniform price of two cents a word, which will include the address, for each insertion, payable in advance. No advertisement will be inserted for less than 30 cents, however small.

Remittances can be made in postage stamps if more convenient. Address,

MOTOR VEHICLE PUBLISHING CO.,
24 MURRAY STREET, NEW YORK.

WILL EXCHANGE ONE OR FOUR lots in Velasco, Texas, at mouth of Brazos river, the coming deep water port of Texas (cost me $1,200 each) for a second-hand auto costing same when new; not older model than 1906. Tom Childress, Arlington, Texas, R. F. D. No. 2.

"HOW TO CURE CARBURETER TROUBLES"—valuable advice from one who knows. Send six cents postage for free 36-page text-book. "Carbureters and Engine Troubles." Breeze Carbureters, Newark, New Jersey.

17 CARS MUST GO REGARDLESS OF cost. Runabouts to 4-cylinder 30 h. p. $3,000 cars $100 to $850. Write for bargain sheet and save money. T. S. Culp Exchange, Canton, Ohio.

20 H. P. TOURING CAR—Perfect condition, top, two new tires, $450. Hart, 147 Main Ave., Passaic, N. J.

BARGAINS—1907 Gale Roadster, with Rumble Seat, cheap; four-cylinder Ford Runabout cheap. Address Box 275, Burlington, Wis.

FOR SALE—300 sets, 28x3, best grade artillery wheels, fitted with clincher rims, less hubs. Write for bargain prices on single sets or the lot. Address Thos. B. Jeffery & Co., Kenosha, Wis.

AUTO TIRES REPAIRED—Tires repaired by experts and guaranteed; low in price; square deal to all. Lafayette Auto Tire Co., 513 North 9th st., Lafayette, Ind.

FOR SALE—Two-cylinder five-passenger touring car; looks like new; complete equipment. Lafayette Auto Tire Co., 513 North 9th st., Lafayette, Ind.

BROKEN CASTINGS WELDED. Any wheel. Guaranteed like new. "Futterman Welding System," New York Coach & Auto Lamp Co., 798 10th avenue, New York city.

CHAUFFEURS, machinists and repairmen can secure free a set of Bullard wrenches. Write us for special offer. Bullard Automatic Wrench Co., Providence, R. I.

FOR SALE—Steam Automobiles; write for illustrated bargain list. F. W. Ofeldt & Sons, Nyack, N. Y.

FORD RUNABOUT OWNERS—Modernize your car with Rumble seat and trunk, $15. Glass front, $12; 3-hinged folding hood, $8; roadster fenders with brass bound running board, $12. Discount to dealers. State your wants for catalogue. Auto Rebuilding Co., Chicago, Ill.

FOR SALE—Beautiful new 50 horse power, seven-passenger Pope-Toledo Model "U" 15 touring car, finished in coral red. Patent leather upholstering, beautiful cape top, 10-in. Rushmore headlights. Will take for part pay any good standard runabout. Robert Holmes & Bros., Danville, Ill.

REBUILD YOUR CAR into "Gentleman's Roadster." We make latest style hoods, radiators, tanks, fenders, "hood dashes," glass fronts, auto trunks, Rumble seats, etc.; 20% saved. Your old car re-designed free. Hood and Dash outfits for '03 and '04 Ford, Cadillac and Winton in stock. Smashed lamps and radiators repaired like new. State your needs for catalogue. Auto Rebuilding Co., Chicago, Ill.

SOME SNAPS—1908 searchlights and generators, samples used for show purposes only, direct at half price, while they last. Miller Mfg. Co., Peekskill, N. Y., Dept. D.

FOR SALE—ALL MAKES OF TIRES, 20 Per Cent. Get our list on cheap tires. 2-cyl. 5¼x6 opposed motor, $110; 2-cyl. 5¼x6 upright motor, $125. Bevel gear axles, $60; wood wheel, $15; pressed steel frames, $15; 1 pair Timken axles and wheels, $70; transmissions, $23; 10 H. P. Olds engine and transmission, $50; 7 H. P. Northern, $30. AUTO PARTS CO., 54 W. Jackson Boul., Chicago, Ill.

CHEAP—Two Hartford Dunlop 32x3½ tires, seconds, for 1905 rim; complete with inner tubes; write for prices. Bradley H. Barnes, Soutnington, Conn.

FOR SALE—Solid Glass Front, new, folding over dash, built for Ford S Roadster. Price fitted to car, $28. Rumble seat for same car, $9. A. C. Cathcart, 636 Westview st., Germantown, Philadelphia, Pa.

WANTED FOR CASH—Remnants of Trimming Cloth, Leathers, Carpets. R. B. Corbett, 862 Summer ave., Newark, N. J.

$105 BUYS tire kettle boiler and fittings. T. S. Culp, Canton, Ohio.

$105 BUYS large tire kettle boiler and fittings, vulcanizer; bicycle, Hartford, $6; Chase, $7. T. S. Culp, Canton, Ohio.

FOR SALE—Valuable patents, covering automobile transmission mechanism. Inquire of Ft. Wayne Gear Co., Fort Wayne, Indiana.

FOR SALE OR EXCHANGE for small touring car, one Kiblinger auto runabout, practically new. John A. Young, Lexington, N. C.

SOLICITORS WANTED.

WE WANT MEN in all parts of the country to solicit subscriptions for the AUTOMOBILE DEALER AND REPAIRER, and are prepared to offer extremely liberal terms. For particulars address the Motor Vehicle Publishing Co., 24 Murray street, New York.

FOR SALE—STANLEY STEAMER, rebuilt last season; 92-inch wheel-base, fitted with Ofeldt new 10 H. P. boiler, and hot water heater; also oil separater flattened tube condenser. Large mudguard and running board. Folding rear seat. Or, I will sell the whole power plant of this car complete, or parts of it, at half price. G. E. Hills, 158 Warren st., Glen Falls, N. Y.

FOR SALE, CHEAP—One Kracker-Jack Vulcanizer, 30x4, one extra mold, 38x3; only used a short time. E. H. Hornbostel, Palmer, Kans.

FOR SALE—1906 Model "C" Wayne. 20-24 H. P.; top, wind shield and extras; in very good condition, all for $650. Address M., 335 Rebecca st., North Braddock, Pa.

FOR SALE—MARSH MOTORCYCLE IN best running order with 1908 engine; not been run 300 miles. Ross Smith, North English, Iowa.

CORBIN (air cooled); good condition; tires nearly new; price $600. Top E. Van Scoy, Bradford, Pa.

FOR SALE OR TRADE for touring car, $3,000; 15 passenger sight-seeing car in A No. 1 condition. Address Box 696, Austin, Pa.

"GRIFFON" MOTORCYCLE, 7 H. P.; 2 cylinders; complete touring equipment; new 26x2½-in. tires; spring forks; powerful and fast on hills. Write for particulars and photograph. H. C. Wick, Jr., 3515 Euclid ave., Cleveland, Ohio.

SLIP NIT FOR AUTO CLUTCHES AND Motor Cycle Belts—Absolutely guaranteed to stop auto clutches and motor cycle belts from slipping. Price $1 per package. Wilson Garage, Berlin, Wis.

FOR SALE—Haynes' Model M, shaft drive, light touring car; thoroughly overhauled at factory, repainted, top recovered, tires retreaded and new Brown & Line three-speed transmission installed this season. Price $500, including top, lamps and generator, tire irons and rear deck for converting to runabout. Address 123 E. Main st., Peru, Indiana.

3¾ H. P. MARCH Motorcycle, $70; good hill climber. M. J. H., Kewanna, Ind.

IF YOU USE A WIND SHIELD ON your car, inclose 25 cents for only method possible to ride through rain. M. J. H., Kewanna, Indiana.

POSITION WANTED—Young man, expert repairer, would accept chauffeur position. Address Matthews, care of Automobile Dealer and Repairer, 24 Murray st., New York.

THE name of the Buffalo agency of the Swinehart Clincher Tire and Rubber Company has been changed to the "Buffalo Wagon Works," and the address is 113 Carroll street, Buffalo, N. Y. A full line of tires for pleasure and commercial vehicles will be carried in stock. It will doubtless be a great convenience to car owners in that section.

Illuminating Gas for Tires.

From George Binney, Wisconsin.—Has any one tried filling pneumatic automobile tires with illuminating gas? If so, can enough gas be pumped in them to perceptibly lessen their weight? Also, what effect does illuminating gas have on the rubber?

Of course, I cannot expect that anything of this sort would greatly lessen the weight of the tires, but at the periphery of the wheels even a few pounds reduction will make the car run easier.

Possibly some of your readers may have all this information at their fingers' ends, and if so, I should be glad to have them give it through your magazine.

THE KLAXON AUTO HORN.

It has long been a problem to produce a sufficiently powerful motor car warning signal for rapid going in the country. It is impossible for a signal to be too loud or startling for this pur-

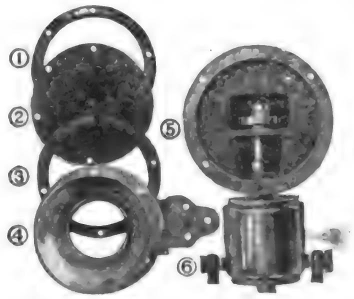
The "Klaxon" Auto Horn, Type "L" Oval Projector.

pose, and the inventors of the Klaxon Auto Horn believe that they have brought out what is unquestionably the most effective sound producer ever evolved. It is necessary for you to hear the Klaxon to appreciate its carrying power and effectiveness. Its note is a tremendous roar, and according to scientific authorities this sound is so penetrating, voluminous and all-powerful that it is absolutely different from any note heretofore produced by man. Though exceedingly loud, it is more the quality of the tone that makes it distinctive.

The cuts show the Klaxon Horn Type "L" Oval projectors; also a back view of the same and a cut showing the mechanism of the horn.

The sound is produced in a very singular manner. On the end of the motor shaft is a toothed wheel that rubs across a knob fastened to the steel disc or diaphragm. The vibration of this diaphragm produces the sound, which is a roar so tremendous that at a distance of a few inches the ear drum would actually be in danger. This horn is operated by a storage battery, and is under the absolute control of the chauffeur by means of a push button.

The Klaxon Horn is manufactured



Klaxon Auto Horn—Detailed View of Construction.
1 and 3. Composition Cork Washers. 2. Vanadium Steel Diaphragm. 4. Short Projector and Collar. 5. Case showing shaft and toothed wheel. 6. Motor with Lacoste patent insulated terminals and binding posts.

BACK VIEW

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Classified Buyers' Guide.

Index to Advertisers.

Vo 2-P. 7 Ind.

AUTOMOBILE DEALER AND REPAIRER

A PRACTICAL JOURNAL EXCLUSIVELY FOR THESE INTERESTS.

REGISTERED IN U. S. PATENT OFFICE.

Vol. 6, No. 1. NEW YORK, SEPTEMBER, 1908. 426586 Monthly, $1.00 per year. Single Copy, 10 Cents.

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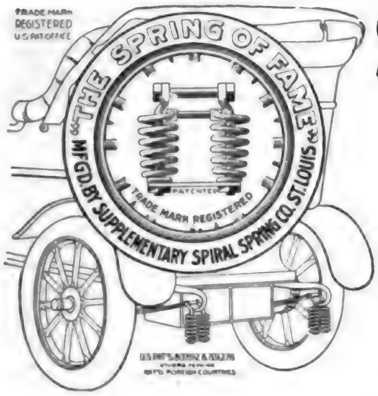

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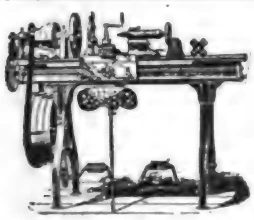

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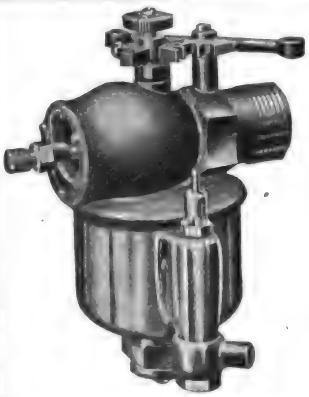

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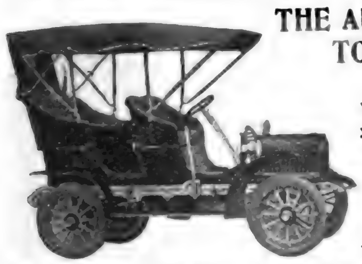

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VOL. VI., NO. 1. NEW YORK, SEPTEMBER, 1908. PRICE { 10c. PER COPY $1.00 PER YEAR

SOME NEW GARAGES.

They Are Springing Up Everywhere and All Do a Paying Business.

It is our purpose to give from time to time examples of instructive and unique garage construction, which just now is receiving more attention from architects and builders than any other part of their business. In the big cities no expense or study are spared to secure the most approved features of convenience and safety.

GASOLINE PUMP ROOM AND PORTABLE TANKS.

In the automobile district of New York, running from Broadway through to Seventh avenue, between Forty-ninth and Fiftieth streets, the Palmer & Singer Co. have erected a five-story and basement building of reinforced concrete, which is as thoroughly safeguarded again fire as it is possible to make it. The first floor has a show room extending the width of the building, its size being 36x48 feet. A small space is occupied by toilet room and ladies' retiring room. The Seventh avenue end of the floor is the entrance way for the garage, leaving about one-third of the entire floor available for storage purposes. There is a mezzanine above the first floor which provides desk room in a gallery over the main show room. The remainder is utilized as a locker room for owners of cars; 450 lockers are provided, two being allowed for each machine stored.

The elevators take an area of 22x24 feet from each floor, and the carriage washer a little less. The turntable located on each floor is 14 feet in diameter, and this also cuts into the storage room. The elevator cars are 10x20 feet, and will carry 12,000 pounds, being of size and

A FLOOR FOR THE STORAGE OF PRIVATE CARS.

capacity to handle the largest touring car. The turntables carry five tons.

THE ELEVATORS WITH THE TURNTABLE BEFORE THEM.

The basement is available for storage and has several repair pits for use on the machines.

The safe and economical handling and storage of gasoline and lubricating oils has been the bugbear of the garage; here, however, the Bowser system of garage equipment for gasoline and oil storage has been used. Under

the sidewalk, two feet below the level of the basement floor, are five tanks of 275 gallons capacity each. A twelve-inch fire wall, without opening into the basement, thoroughly isolates the tanks. Within this area filling has been placed to the sidewalk level, so the tanks are completely covered. This is necessary to meet the regulations in New York. The filling of the tanks is accomplished directly from the street through sidewalk connections, the gasoline flowing from the barrels on the wagons into the tanks. The tanks are separately vented to a main vent pipe which leads to the roof. The delivery of the gasoline is accomplished by means of three pumps. These pumps measure the gasoline as delivered and record by the pint, quart, half gallon and gallon. From these pumps the gasoline is delivered into a portable filling tank which contains fifty gallons. This can be wheeled directly to a machine at any point and the supply pumped in and measured.

The lubricating oil is handled in a similar manner. Four 250-gallon tanks for different kinds of lubricating oil are located in the basement. They are provided with recording apparatus to show the standing supply and have a special barrel track for convenience in filling the tanks directly from the barrel. A lubricating oil pump from each tank is located in a screen inclosure on the first floor. From this room a portable lubricating oil tank is supplied. This carries four tanks of ten gallons capacity each, each tank having a recording pump, so that the amount of oil delivered to a machine may be charged to it. The second floor has the business offices of the concern, chauffeurs' room, locker room, toilet, showers, etc.

The third and fourth floors are entirely given up to storage. About forty large machines can be stored on a floor without crowding. The live load allowed is 150 pounds per square foot, which is adequate to carry the heaviest machine.

The top floor is used principally for the repair shops,

THE MAMMOTH GARAGE, WHITE PLAINS, N. Y.

with a storeroom for machine parts at one side. There are four repair pits, where work may be done on machines.

The estimated storage capacity of the building is about 175 private cars.

Probably one of the most complete and spacious garages in the country outside the larger cities has been recently erected in White Plains, N. Y., an illustration of the front of which is given herewith. It is situated on the principal residential thoroughfare leading out of the city, is 80 feet front and 200 feet deep, built entirely of concrete, and strictly fireproof from cellar to roof. It is splendidly lighted in the rear by unusually large windows, and contains everything that can be devised for the convenience of patrons. Especial attention has been given to the machine shop, which contains not only tools and machinery for every kind of repair, but if necessary, a new car can be built and assembled there. The storage rooms will accommodate about one hundred cars, and the appliances for cleaning and examination of cars give every facility for such work. It was built under the direction

ANCIENT DWELLING TURNED INTO A GARAGE AT NEW ROCHELLE, N. Y.

of George J. Grossman, formerly president of the United States Title and Guarantee and Indemnity Company, of New York City. It is called the Mammoth Garage, and the front is decorated with heads of that prehistoric beast.

This garage supplies a striking illustration of the faith of an accomplished business man in the present and potential possibilities of the automobile as the universal vehicle of travel.

In New Rochelle, N. Y., a dwelling of the colonial period has been transformed into a garage. It is on an automobile thoroughfare and is doubtless of far more use for this purpose than for any other, the large sign across the end of the ancient dwelling being so conspicuous that it can hardly escape notice.

No Paint for Rubber.

A contemporary has the following advice concerning the care of a car: "Usually after the rubber matting on motor cars has been in use for a time its uniform color disappears, the oil and grease collecting upon it from boots, and by dripping, tending to rot and discolor it. To prevent the destruction and discoloration the matting should be painted with lead-colored paint, which, when dry, gives a varnished surface. Not only is this oilproof, but it gives a bright look to the mat, and renders it easily cleaned by means of a cloth." As a rule, chauffeurs of experience complain bitterly when the rubber matting of the long side steps and footboards is painted over if they become old and dull. This means of rejuvenation has the disadvantage of showing every footmark, and we are not willing to readily agree that oil paint is the best possible preservative of good india rubber, and, on the other hand, a thin coating of paint will soon wear off and look patchy, and in the daily touching up soon presents an untidy appearance. Powdered whiting, rubbed in with a stiff brush, is a method which has received approval both from owners and drivers who take particular pride in the appearance of their cars.

THE GARAGE

BUILT IN ONE DAY.

An Inexpensive Garage That Meets All Needed Requirements.

BY JAMES F. HOBART.

A gentleman living in northern Ohio one day caught the "gas wagon" fever and straightway succumbed to the seductive wiles of an enterprising agent and purchased a car. Straightway, trouble came to that man's house. There was no place where the car could be stored, and the building of a garage was a necessity. As the gentleman was occupying a rented house, there was no inducement to erect an expensive or even a permanent structure, and as the garage was to line up with a shed or two, it was determined to erect as cheap a building as possible.

Unfortunately, it was found that 16 feet was the greatest depth or length that could be given the structure on account of the room between the driveway and a neighboring building belonging to another party. But as it was not intended to make any repairs whatever in the

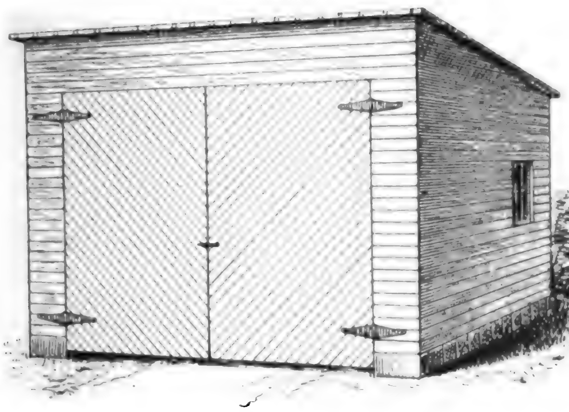

FIG. 1—A GARAGE BUILT IN ONE DAY.

garage it was thought best to get along with that length of building, although two feet more would have been very desirable in order to have plenty of room at each end of the car. A width of 13 feet was given to the building, a height of 10 feet in front and 8½ in the rear, the roof sloping from front to back as shown by Fig. 1.

The exterior of the building is shown in perspective and represents closely enough the general appearance of the structure. There is a total lack of all finish, either of corner boards, casings, coving, or door or window frames. The entire effect sought for is to provide a roof and walls which will give shelter against rain, wind and dust. The sides of the structure are covered with novelty siding evidently made from sapling pine, and white pine at that. The roof is composed of spruce boards, planed on one side and matched, and covered with one form of ready roofing which chanced to be plentiful in a neighboring hardware store. The roofing came in the form of felt, which only needed to be tacked or nailed, three-penny wire nails and crimped tin washers being used as shown along the edges of the roof boards, which extend about 4 inches beyond the side boarding of the building in every direction. A small parcel of cement comes with each roll of this roofing, and after the felt is nailed in place and the cement applied to the joint, nothing more need be done to secure a perfectly tight roof.

The foundation of this garage is composed of a peculiar form of clay product which is indigenous to this locality and which is used largely for foundation purposes for small buildings and for dwelling houses. This material comes in 16-inch lengths, each 8x8 inches, and each joint costs but ten cents delivered One of these pieces of clay product is shown by Fig. 2. The walls are about ⅞ inch thick and the entire surface is salt glazed, thus making it impervious to water. In erecting this garage, nothing was done further than to level the top side of a row of these tiles which were laid on top of the ground. In some places an inch or two of soil had to be removed, but in other parts of the foundation the tiles were laid on top of the turf, even the grass not being removed. As the garage was located upon a piece of lawn which had been kept closely mowed, it was about as smooth as possible, and all that was necessary was the leveling of the upper surface of the tiles. No cement or other mortar was used in laying them. They were not even mortared together, but were placed side by side, or rather "end to end," perfectly "dry and bareheaded," and the sills placed upon them without being bedded. The sills were 2x4-inch spruce and the studs were 2x3 inches spaced 16 inches between centers. The roof beams were also 2x3 inches, 16-inch centers, and set edgewise upon the 2x3-inch plates.

Plates, also 2x3 inches, were toe-nailed to the studs and the roof beams were in turn toe-nailed to the plates. The siding was run up even with the top edge of the roof beams and then lined and cut with care to the exact slope of the roof. The siding was then nailed into the end of each roof timber, thus forming a very strongly fastened roof and one which would not be likely to be carried away when the doors were open and a high wind blowing.

The doors were made of two thicknesses of boards, the inner thickness being matched spruce, planed one side, the outer boards comprising the other thickness were tongued and grooved, and were quite narrow, not more than 2½ or 3 inches at most. Failing to obtain some narrow white pine beaded sheathing, the door was faced with yellow pine flooring which, although rather heavy, made a most excellent door. The two thicknesses of stuff were fastened together with clinch nails, which were hammered well into the inside spruce layer of stuff. Fig. 3 shows the manner in which the doors were put together, the plain matched boards, *A, B, C, D,* etc., being first gotten out to the exact size required for the door and temporarily tacked to boards *F* and *G,* which serve merely to keep the door in shape until the outer surface of boards can be fitted and nailed in place.

The crack between the two middle boards is made to come about 1 inch one side of the center line, as shown at *P,* where *H* is the center of the door, and the line of the finish boards when the door is complete. But the inner layer of boards must be divided along the line *P* 1 inch or so one side or the other of the center line of the door. The side on which line *P* is to be placed will depend upon which half of the door it is intended to open first. As arranged, the left half will open first. If it is desired that the right half of the door should open first

then the line *P* must be placed upon the right side of center line *H*.

Next the straight edge *J* is fastened in place as shown by means of a few nails or screws. It is necessary that this strip be fairly straight, also that both boards along line *P* be well straightened before they are put in place. With straight edge *J* in place, cut one end of one of the

FIG. 2—FOUNDATION TILE.

narrow finish boards to an angle of 45 degrees and fit it against *J*, as shown at *K*. The better each board fits along the straight edge, the better the appearance of the finished door.

In starting the outer boarding of the door two methods are open to the carpenter. One way is as shown by Fig. 3, the center of the "herringbone" pointing downward to the center of the door. The other way is to start the boarding in the other direction; that is, at right angles to the finish boarding shown by Fig. 3. The chief points of difference are two: with the boarding as arranged in the engraving, all the water which runs down the face of the door tends to follow the cracks between the boards and finally finds its way down the center of the door. With the back of the "herringbone" pointing upward, the course of the water is toward the outside of the door and it runs down into the hinges and helps rust them out. When the door is hung to slide, the water will run down inside the casing and reach the floor of the building, whereas with the boards arranged as shown by Fig. 3, the water will run upon the threshold and be carried away. The boards are in tension as shown, and in compression when the herringbone points upward. Take your choice.

With the door made of two thicknesses of ⅞ inch stuff, nails not over 2¼ inches long should be used.

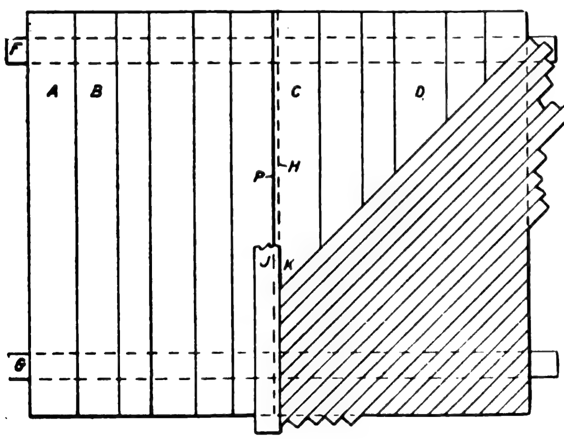

FIG. 3—DETAILS OF DOORS.

Sometimes a door is put together as shown, and blind nailed, but this method can never make a very strong door. It will stand for a time—perhaps—but then the door will prove to be rickety and soon need repairs.

As the doors must be hung by means of heavy strap hinges to studs on either side, which in turn must stand on short pieces of sill, some means must be found for securing the short sills lest they are thrown out of place by the force of banging doors. A very good method is shown in Fig. 4, the short end sill being tied to the side sill in two places.

The end sill is shown at *E*, the long side sill at *D*, both sills resting upon the foundation tiles *A*, *B*, *C*. The studs are placed as shown at *G*, *G*, and the 2x4-inch brace *H* cut in between two studs and spiked to both, besides being attached with a "crow-foot" to one stud—that toward the short end sill—and spiked to both sills. This forms a fastening which cannot well carry away without breaking something. It would be well to double the stud to which each piece of door must hang and one or two short pieces of 2x3-inch stuff may be cut in between the studs on the end of the building and will, as bridging, help make the structure much more solid under the strain of the door.

It must, however, be kept in mind that the strain of the door is mostly transmitted through the upper hinge, therefore the greatest strength is needed at the top of the door. Here the stud is fastened to a girth which extends across the opening above the door and serves admirably to tie together and stiffen the door studs, also to equalize the strains of the two half doors. It will be well to put a sort of truss in the space above the doors, two pieces of 2x3-inch stuff being spiked in and somewhat resembling the letter A, but in very extended form. The legs of the A to be spiked to the overdoor scantling close to

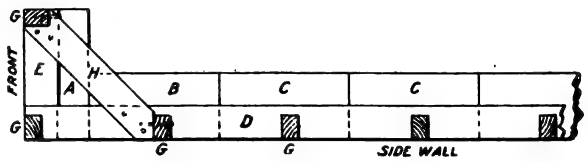

FIG. 4—BRACING OF DOOR POSTS.

the studs to which the door is hung, while the apex or point of the truss bears underneath and is spiked to the center of the end plate of the building. This plate may also be stiffened by having a 2x3-inch roof beam spiked the entire length on top of the plate. This, together with the elementary truss already described, and a sort of "king post" in the shape of a piece of board nailed to plate and apex of truss, also to middle of 2x3-inch over the door, serves to keep that member of the frame from sagging, no matter how considerable may be the snow load, or the "sag load" upon the framing over the door.

Any sagging of the frame and the boarding above the doors would cause much trouble. It would prevent the doors from closing and necessitate considerable trimming of the top of the door from time to time. The stiffening and trussing described above will keep the over door framing in shape and save all trouble in that direction.

For the storage of gasoline, two extra foundation tiles were bedded in one rear corner of the garage and a vertical gasoline tank, capable of containing a barrel of that fluid, was mounted upon the tiles. The tank was fitted with a key faucet for drawing out gasoline and the filling opening was also provided with a locking device whereby it could not be opened by children or meddlesome persons. The gasoline vessel was painted a bright red and marked "Gasoline" in plain white letters. This marking of gasoline-containing vessels is compulsory by state law in Ohio, and it applies to all trade, manufacturing and domestic vessels, hence the automobile supply of gasoline must be kept in a red bottle with a white label, and the housemaid cannot blow herself up with gasoline unless she takes it from a red can with white trimmings. This law—an excellent one, by the way—prevents all mistakes between kerosene and gasoline, and while it is bad enough to pour kerosene from a can upon a kitchen fire, it prevents the mistake heretofore frequently made, of pouring gasoline upon the fire, mistaking it for kerosene. While the stor-

age of a barrel of gasoline in a garage may not be kindly looked upon by some insurance locations, it evidently goes all right in Ohio, where every storekeeper keeps a lot of oil and gasoline in a little 6x6-foot shanty in the rear of his store.

The painting of this garage was in keeping with its construction. The owner did not care to go to the expense of lead and oil, or zinc and oil paint, so he purchased a lot of whiting, some kerosene oil and a few pounds of washing soda. The latter was dissolved in water until no more soda would be taken up. Then the oil was added to the soda water until no more oil would be taken care of. The uncombined oil would rise above the combined oil and soda water, which formed a pasty mixture, an emulsion in fact, which was easily separated from the oil.

Next whiting was mixed with the emulsion until the mixture was of the right consistency to apply with a brush. The first coat went on pretty hard and a little gasoline was added from time to time to make the mixture spread better. The second coat went on easier and covered the surface in great shape. It has the appearance of genuine lead and oil paint, it does not rub off much, and seems able to protect the wood for four or five years at the least. For a cheap "get-there-quick" paint, it certainly is the limit and takes the cake.

Tire Pressure.

A warm discussion is going on in England as to the proper inflation of tires. An expert named Edge claims to have demonstrated that in running a 3,500 pound car with 60 pounds pressure instead of 80 pounds he secured the somewhat astounding increase of efficiency of 88 per cent. That the less pressure makes the car run easier cannot be questioned, but when the tire itself and its life and endurance are considered, it places a different aspect upon the matter.

Not the least danger in running slack tires is the side strain, especially in turning corners. We believe that the following tables of pressure will be found most satisfactory, all things considered:

65 mm.—To carry 600 lbs. per wheel. Air pressure: Back tire, 70 lbs.; front tire, 65 lbs.

85 mm.—To carry 660 lbs. per wheel. Air pressure: Back tire, 80 lbs.; front tire, 70 lbs.

90 mm.—To carry 900 lbs. per wheel. Air pressure: Back tire, 85 lbs.; front tire, 70 lbs.

100 mm.—To carry 1,000 lbs. per wheel. Air pressure: Back tire, 85 lbs.; front tire, 75 lbs.

105 mm.—To carry 1,050 lbs. per wheel. Air pressure: Back tire, 85 lbs.; front tire, 75 lbs.

120 m.—To carry 1,300 lbs. per wheel. Air pressure: Back tire, 95 lbs.; front tire, 90 lbs.

135 mm.—To carry 1,400 lbs. per wheel. Air pressure: Back tire, 100 lbs.; front tire, 95 lbs.

Adjusting the Speedometer.

In attaching the driving gear of a speedometer to the wheel, a simple method of centering it so that it is true in its relationship to the shaft gear, is to hold a piece of chalk between the fingers, and with the hand resting on and steadied by some permanent fixture, such as the steering arm, turn the wheel so that the chalk will mark the spokes of the wheel in a practically perfect circle. With this chalk outline as a guide it is easy to properly adjust the driving gear. Unless the gear runs true, it will be the cause of an objectionable noise, and this annoyance will be avoided if care is taken when the attachment is put on the wheel. Naturally the life and usefulness of the speedometer depends to a great extent on the proper adjustment of the drive.

THE LAWLESS DRIVER.

Looking at Accidents Through His Own Oblique Vision.

Over on Long Island may occasionally be seen a man with an empty sleeve and a scar on his forehead. He was formerly a chauffeur, and of course the accident came when he least expected it. His employer was more unlucky, for he lost his life in the spill, and the ex-chauffeur is now living on a small pension given him by the family of his late employer. Speaking of accidents at much traveled grade railroad crossings, he said he did not think much of the proposed remedy of stationing special detectives at such crossings to time the automobiles over a measured distance, ascertain their license number and then publish the names of the owners of the big cars as shown on the official register, in the hope that publicity will prevent reckless speeding. He said:

"When I drove a car I used to figure to best the deputy sheriffs and local constables who set traps to apprehend autoists exceeding the speed limits, and the average chauffeur to-day is slick as greased lightning when it comes to making a 'get-away.' It's all easy enough to talk of identifying owners of cars by the license number, but it is difficult to note correctly the number when moving at thirty miles an hour. To catch the number of a car speeding at twice this speed and enveloped in a cloud of dust is almost an impossibility. A dab of oil on the license board at the tail of the car before starting out on a fast run over a dusty road will soon obscure the number. Did I use to drive fast because I liked it? Well, no, not at first. But it was any way to get there with my employer; my position paid me well, and I knew that if I didn't speed up my car, that there were plenty of others willing and anxious to step into my place. And then the fines are never deducted from the wages of the chauffeurs. The desire to get the best there is out of a car grows upon one. A chauffeur always feels that there is nothing going to happen to him. It's 'open her wide' and anything to get the best of the other fellow, and let the drivers of vehicles and the pedestrians look out for themselves. When a chauffeur once arrives at this feeling, no flagman will stop him—he'll race with death first and laugh with exultation if he outran the iron horse in a dash for the crossing if only by a hair's breadth he escapes being ground to pieces. He always discounts danger and figures that the accidents will occur to the other fellow."

The foregoing is certainly more frank than it is creditable to the speaker. Any one who holds such views and who is governed by them is a greater public menace than a highwayman. It is gratifying to feel that such instances are not common, however. Most car drivers are law-abiding and have no desire to endanger the lives of others or themselves. It is the 10 or 15 per cent. remnant that makes all the trouble.

Cleaning Car Floors.

To those who have aluminum floor and running boards and desire to keep them clean, the following are suggestions and methods of restoring the metal to a brighter appearance, the first being to brush the surface over well with a dilute solution of sulphuric acid, about five to eight parts of water to one of acid being satisfactory. This is applied to the surface with a stiff bristle brush, and the surface well rubbed, after which the excess acid is removed with water. Another method sometimes followed is to make a mixture of turpentine and fine emery, which is applied to the surface with a bristle brush, and after vigorous application and rubbing, the surface of the metal will be well polished and bright.

PUBLICITY.

How the Dealer May Advertise at Small Expense.

Thus far automobile dealers have not given the subject of advertising the attention and thought it deserves. It must be remembered at the outset that the automobile field has as yet been scarcely more than scratched. Nor has the general public at present much of an idea as to the convenience of the automobile what it will really do, its relative cost in comparison with horse-drawn vehicles, and its special advantage to those who do not ride constantly, as well as for those who do.

Of course you cannot sell a man a car unless he knows at least something about it. So the first thing is to get acquainted. But how? Well, you might write an exposition of the car and send it to possible purchasers. Or you might send salesmen out to tell about the car and solicit orders at the same time. Or you might put parts of your exposition into space in the local newspaper.

The first possibility is impracticable because you don't know who the possible buyers are, in any sufficient numbers. The second is open to this objection, while the third possibility gives better promise of success, but for every interested person reached you are paying the publisher for telling at least fifty who are not interested at all. So the best plan is to use the local papers and say only enough to attract attention, pique curiosity and get acquainted. But it is far easier to mention the class of business men who should buy automobiles than to name those who may buy them. Often a purchaser is found where least expected, and quite as often where one is most expected he cannot be induced to purchase. Taking this into consideration, the automobile dealer should be as constant and thorough an advertiser as those engaged in any other similar business that has not been fully developed.

But how can the dealer get the most and the best publicity at the least cost? In order to make such advertising profitable, small space only should be used as a rule, and this necessitates a suggestive rather than an exhaustive advertisement. As a first step get the reader's attention. Put a short advertisement in the local paper reading something like this:

> **TAKE A FREE RIDE.**
>
> We shall be glad to give any one thinking of buying a car a free ride on appointment, and will call for him and leave him at his home.
>
> This of course entails no obligation to purchase.
>
> BLANK & CO., 19 Main Street.

If you can get an intending purchaser into your car you ought to be able to make a sale, provided you know your business—the advantages of an automobile over a horse-drawn vehicle, in the matter of service and economy. If you do not know this, and know it so well that you can back it up against all arguments that any bright man can bring forward, then you are not a competent salesman. Here is another good advertisement to draw the attention of the public, and simply because it makes a statement contrary to the general impression:

> **HORSES ARE A LUXURY.**
>
> Get an automobile and be economical. We will prove to you why it will be economical for you to sell your horse and carriages and get an automobile if you will call.
>
> BLANK & CO., 19 Main Street.

But in addition to this it will pay the dealer to take the editor or the reporter of the local paper and give him a ride whenever possible. It shows a friendly feeling that the recipients will appreciate and quite likely be disposed to reciprocate by making mention of the car in a way that it would take a good many dollars to purchase. In these days publicity is imperative. It must be had in some way, and if not in one way, some other must be devised. No matter how good your car may be, you must spend much thought and some money in sending the facts home to the public so as to make a permanent impression.

SELL THEM AUTOMOBILES.

Possible Customers for Cars in Every Locality.

There are in most every locality among the well-to-do and idle some who suffer from general debility and anaemia or other ailments due to lack of fresh air and exercise. Automobile dealers should go to all such in whom there is a possibility of selling a car and say this:

Buy a car and use it, and I will guarantee that you will have improved and possibly completely restored health—something that all the doctors and drugs in the world cannot give you The most marked effect of regular automobiling is on the blood. Quantities of oxygen are absorbed into the blood both through the lungs and through the skin. Improvement takes place in the ordinary form of anaemia in the way of increasing the reduced number of red blood cells, while in chlorosis, in which the coloring matter of the cells is deficient, the result is equally satisfactory.

Neurasthenia is another disease in which motoring has been very successfully prescribed. One of the greatest troubles of the neurasthenic, a symptom which has often been the despair of physicians, is the inability to sleep. In cases of this sort in which there has been no actual pain to cause insomnia, the soothing effect of the continuous, even rush of the air has in many recorded cases wrought a permanent cure.

In neurotic patients, who are constantly depressed and low spirited, the tonic, exhilarating effect of the rapid rushing through the air and the continual unconscious concentration of the mind on details of the passing scene afford at least temporary relief from the constant brooding over trifles, which is the chief symptom of this peculiar ailment, and thus leads to permanent cure. On the other hand, in nervous diseases with exaltation of spirits in hysterical conditions and in epileptic and alcoholic cases, motoring seems to have a too stimulating effect on the unstable brain centers.

The benefit afforded to chronic gouty and rheumatic sufferers lies in the vibration and constant slight movement in the affected joints. In this way practically the

same result is obtained as in the tedious passive movements done by hand by a trained expert.

Without quite understanding the cause of improvement, many observers have recorded the beneficial effects of motoring on certain chronic and intractable skin diseases. In particular pruritis, a nervous disorder of the skin attended by distracting tingling sensations very difficult to cure by ordinary means, has been shown to be most amenable to motor car treatment.

It is not too much to say that motoring holds a unique position in the pharmacopœia of to-day, both from the pleasure which may be got during the treatment and in the multiplicity of ailments in which it has been shown to be of value.

TESTING THE CAR.

The Most Important Point in Automobile Manufacture.

The car owner who lazily lolls in his sumptuously appointed vehicle has little or no conception of the energy and time that have been spent in the tuning-up and testing of his luxurious car. If this part of the motor business could be eliminated, prices could go down, and, *ipso facto,* profits go up! But it is just the question of the thoroughness with which this tuning is done that spells the difference between the best and the mediocre car—at least, from the user's point of view. We are all too familiar with our car's little vagaries, and consequently the quiet contemplation of the lot of those who spend their time tuning cars brings one to think that, like the policeman's, "their life is not a happy one." The condition of a car or chassis handed to a tester may be likened to that of a piano with the strings all loose. The parts are there; the puzzle is to find the correct combination and adjustment.

Undoubtedly a first-class tester is born, not made. The mere mechanic is no good; the average driver is useless; the ignorant, but frequently vaunted, practical man is not to be seriously thought of; and the theoretical person is equally at sea. All cars have idiosyncrasies of their own, and it requires a sympathy, grasp of underlying principles, infinite patience, and accurate knowledge that very few possess, if success is to be obtained within a commercial period. The word commercial is used advisedly. Many people—repairers and what not—eventually arrive at a solution of their difficulties by a process of elimination. Most of us have heard of, or had to pay for, a gear box being dismounted when it was not to blame, and the real cause of the trouble—a lack of petrol, a missing touch, or something equally ridiculous—has been discovered afterwards by the simple process of having tried everything else. The chief attribute, then, of the born tester is that he arrives at the root of a fault without costly and uncommercial delays, and without doing everything on the off chance of doing the right one.

Testing is not without its dangers either. A man who is a tester recently took a friend out tuning a car. The car ran splendidly, and everything was nice and comfortable, until in turning rather sharply the seat the tester occupied elected to go straight on, or, in other words, came off; so did the friend. The tester mildly suggested that if the friend had said he wished to get off the car could have been stopped for the purpose. I happened to be the friend, and though I fully realized that I was only obeying a well-known law of matter in motion—that is to say, I was a sort of loose body and tended to move in a straight line—still I could not help thinking that a practical demonstration of the security, or otherwise, of seats on cars had its drawbacks, and I confess it considerably damped what little ardor I possessed to become a tester. My friend consoled me with the thought that I had definitely proved the fastening insufficient and insecure, and, after all, that was what we were out for. The cold fact duly appeared in his testing report. The subject, then, from the motorist's point of view, is an important and interesting one. Efficient testing and tuning mean everything to the prospective owner.

In one of the leading firms the testing department is looked upon as one of the most important in the whole concern, and the testers have instructions to play the part of expert, aggressive and discontented customers. It is comparatively simple to satisfy a goodly proportion of buyers, and they probably don't realize for years the difference between a well tuned and an indifferent car. This is just where the tester plays his part in a good firm; he stands between the manufacturer's mechanic and the harmless and unsophisticated prospective owner.

The efficient tuner always has a definite routine. The various important details are considered separately—the engine must be up to standard power and quiet, the car fast on the level, climb hills, run slow on the top gear, throttle well, pick up readily, keep cool in traffic and at speed, and consume a minimum of gasoline. There is nothing in making an engine throttle, nothing in making it pull well, nothing in making it climb well, nothing in making it economical in gasoline; the trouble is to get the combination in one car. The gear box and transmission also have to be considered with great care. The result is the same to the man who is delayed by, or has to pay for, gear trouble, whether the cause be bad material, indifferent workmanship, or merely a missing split pin. Indeed, possibly the missing split pin is the most annoying, as "ifs" and "might-have-beens" are far from comforting, and if anything of this kind does happen, the first question the principal asks is, "Who tested the car?" There is another difficulty, too. After the chassis has been reduced from chaos to a resonably tame article the coach builder works his wicked will. Some carriage makers have a playful habit of taking off road wheels, removing side brakes and replacing them doubtfully, filling up oil holes with paint, and a thousand and one other little ways inimical to the peace of mind of the motorist. The body may foul the wheels when it bumps and sways on the road, or the chains may touch the step supports through insufficient clearance having been left somewhere, and, indeed, numerous little defects, such as obscure squeaks, noises and rattles, that make all the difference to the comfort of the owner, have to be located and remedied after the whole car is fondly supposed to be finished and perfect.

Then comes the final oiling and greasing up, the pumping of tires to the correct pressures, the packing away of spares, the last polish up, and then for the road. The writer never yet saw a new car leave the makers without a sigh of relief being uttered by those responsible for getting it off. It is alike a joy to those who've got it and those who've got rid of it.

There must be a good time coming when chauffeurs will keep cars running in the condition they are turned out from the makers. There is certainly no reason why a high class modern car should not give perfect results without much trouble for the first eighteen months, provided a reasonable amount of intelligence and care are displayed by the man in charge. The driver is certainly one of the most important links in the chain—a good man invariably seems to have a good car, and an ignorant, lazy man a bad one. The pity is so many owners are not sufficiently *au fait* to judge as to their drivers' capabilities, but everything improves as motor knowledge spreads.

MAKING GOOD TIRES.

How to Do It and How They Should Be Used.

The things that go to make a pneumatic tire are rubber, fabric and machinery. To produce a good tire these must all be of the best quality for the special purpose. Everybody knows where rubber comes from and how it is procured, but few know about the fabric that goes into a tire or the machinery that puts it in shape for use.

The fabric is called Sea island fabric, because the cotton from which it is made first grew on the islands just off South Carolina, but Sea island cotton is now obtainable in many other sections. This cotton is famous for the length and strength of its strands. The fabric is manufactured according to weight, so many strands to a thread, so as to arrive at a certain weight to the square yard, according to the requirements of the tiremaker. It is then sent to the rubber factory, where it is unrolled and each strand separated and untwisted and inspected under a magnifying glass to see if there are the required number of strands to a thread and the proper number of threads to the square inch. It is then placed upon the testing machine, where it is required to stand a tensile strength of 320 pounds to the square inch.

Then comes the manufacturing process proper. From bins in the cellar are brought the chunks of rubber, and first of all the processes comes the washing. A large room is devoted to this cleansing enterprise. In the center is a great tank, around which hot water is kept circulating. There are paddles which keep the rubber in motion, and it is thus softened and partially freed from dirt.

Next the rubber is cut into small pieces and run through the washing machine. There are several of these. One is an apparatus with two corrugated rolls running in opposite directions. From above a stream of water constantly plays on the two rolls, and as the rubber is fed into the rolls the water washes away all the grit and dirt that has survived the first laving. This machine also rolls the rubber into thin sheets ready for drying. There is also a vicious machine with cogs, which crushes and masticates the rubber, also grinding up the stone and grit which may be there, so as to make it easy for the other devices to wash it out.

The sheets are taken from the washing room to the drying department, and for three or four weeks tons of this thin rubber hang in a hot room till the last semblance of moisture has evaporated.

Next come the milling and compounding. Pure rubber would be utterly worthless for use as an automobile tire. The tread, for instance, would wear down in a run of a mile. The rubber must be compounded, mixed with sulphur and other ingredients, which vulcanize, harden and give durability. Here is the secret process of most of the manufacturers. All have formulas which they believe give the greatest resiliency and durability and these are guarded with jealous care.

The calender machine is used to wed the rubber to the fabric. The fabric is fed from the front. On the back of the press great masses of softened rubber are placed. These masses are about the consistency of a thick cornstarch pudding. Oozing, cracking and slipping, the softened rubber, held in place by friction, gradually slides through the rollers, there to meet the fabric and be forced completely through its meshes. These rollers are steam heated, and from a roller a strip of linen is run between the rubbered fabric so as to separate it and prevent its going together into one solid mass.

From there it goes to the coating calender, where a thin sheet of fine Para up-river rubber that covers the entire surface of the fabric is applied. The fabric is then ready for the tire stock department. Here it is cut up to the desired widths and lengths for the different tire sizes. The fabric and the rubber are now ready for the hand of the actual fashioner of the tire.

Four parts make up the tire. These are the carcass, the breaker strip, the tread and the inner tube. The carcass is built upon metal cores. These are nothing less than rings of iron, varying in circumference according to the size of the tire to be made. On these cores the tire is gradually built up by hand, layer on layer.

Over the round face of the core the operator lays his strips of fabric, exerting the utmost care to see that every crease and wrinkle is rolled out. The layers are made fast, one to another, friction tight, by careful rolling with a little roller, like the wheel of a roller skate, which is mounted on a handle eight inches long. Layer after layer is put on till the desired thickness is obtained.

Then comes the breaker strip. This goes between the carcass and the tread. It is a strip of tough fabric, to strengthen the structure. It is a fabric of a coarser mesh than that used in the inner layers Applying the tread is an important part of the tire, for it is the portion that bears the strain of actual contact with the ground. There are seven layers in an ordinary tread, so imposed one on another as to get the greatest thickness in the center, where the weight of the automobile will be.

When the rubber, a long sheet about a quarter of an inch thick, is brought to the table it is cut into seven strips the length of the table. The wide strip is probably seven inches in width, and the others range down till the final one is about two inches. The wide strip is first put on the tire in the course of construction, right next to the breaker strip. Then the next widest strip is put on exactly in the center, and so on till the narrow strip is in its place. Then the great thickness is in the center, the least on the outer edge.

Next the tire must be cured. Each tire goes into a mold. Securely clamped the mold is pushed into a great steam chest and subjected to a heat of 288 degrees for three hours. The application of this heat completes vulcanization of the rubber and also toughens it. It is an exact heat, scientifically determined, and this is essential, for an overcure would make the tire brittle, just as an undercure would leave it too soft.

This represents one process. What is known as the wrapped tire is differently cured. The carcass is built up on the core as in the other process. Then it is wrapped in fabric and put in an open steam chest to be partly cured before the tread is put on. The tread is also partly cured in advance. Then when the two have been put together, the whole tire is carefully wrapped with fabric and is put on a great sliding steel beam. When the beam is filled it slides on a track into the interior of a great steam chest and here the curing is finished. It is the argument of the makers of such tire that the thickness of the tread makes it difficult to cure the whole tire, clear through uniformly in one operation; hence the separate curings before the final treatment.

After the tires are properly vulcanized the wrappings are removed and the tires are stripped from the molds and delivered to the inspecting department, where they are scrutinized by the most expert of automobile tire builders, whose vision and ability is such that they can readily detect any small defect in the tire. Those tires that are passed by the inspectors are then sent to the finishing department, where they are trimmed and cleaned up ready for shipment.

Nothing is left now except the preparation of the inner tube, that which is expanded by pump to give the tire its buoyancy. As the inner tube never comes in contact with the ground it is made of virtually pure rubber. First the rubber is cut into a flat strip, then it is fashioned into a

roll on a long iron pole. The larger the tire the thicker the inner tube must be. Two or more thicknesses of rubber are used, according to the size. After the tube has been shaped it is wrapped with cloths and cured in open steam heat for about fifty minutes. It is joined by turning the ends inside out, buffing them together in tapering form and finally applying powerful cement. Then follows another rigorous inspection. The inner tube is really the heart of the tire. If it shows a flaw, it is discarded.

This is the tire the maker gives the public. It is the product of the best materials, of careful workmanship, with conscience superintending every detail. This being the process, expense and care required to make a perfect tire, it deserves intelligent and careful treatment after it has been put on the car.

Although a car will run with less gasoline if the tire is not pumped too hard, its life and service are greatly prolonged if pumped to the limit. An easy inflation saves the gasoline; a hard one saves the tire. Changes in atmospheric conditions should also be borne in mind. A tire pumped up too hard in a cool garage or on a cold day is in some danger of bursting if exposed for a long distance to a hot sun. The reverse is also true. A tire sufficiently inflated in summer will require additional inflation when used in cold weather.

Too much emphasis cannot be placed upon the statement that the fabric will slowly disintegrate and rot if water reaches it, and its strength is rapidly reduced. Care is also necessary to keep water from reaching the fabric through cuts in the tread. This cannot be too emphatically stated. Vulcanized repairs are the remedy.

Unlike fabric, rubber is impervious to the effects of moisture. It is, however, very susceptible to the chemical action produced by grease, oils, a great variety of acids and long-sustained heat. None of these should be allowed to come in contact with the tire or spare tubes or casings. A cool place not open to the direct rays of the sun is the best place in which to keep tires. Neglect and carelessness make a lot of the tire trouble that is the bane of the motorist.

A puncture occurs and a tire is run flat. It is too much trouble to avoid or go slowly over freshly broken stone or other obstructions. It is convenient to run in the street railway tracks. It is too bothersome to take pains to avoid tube pinching in applying a tire—too troublesome to pump a tire up thoroughly after a new tube has been put in on the road. Deep ruts wear the sides of a tire rapidly. Curbstones grind like emery wheels and sudden application of the brakes produces the same effect.

Violent skidding or sudden impact with an obstruction is not seriously felt, perhaps, but it is only because the tires have taken the force of the blow and saved the driver, the car and all its mechanism. Take good care of your tires. They deserve it.

Things That Sell Cars.

A good many cars of a given kind are purchased simply because others in the same town or city have them, especially if the aforesaid others are leaders in social or other walks of life. The easiest way to note this is to go to half a dozen different towns and watch the first twenty cars go by. In one town twelve out of the first twenty may be one kind. In another town the twelve will be another, in another they will be still another make, and so on. In certain smaller towns out West, for instance, an actual majority of the cars owned in the place will be of some make that an eastern man has never known or seen. In New York there will be seen an astounding number of foreign cars, and the whole fact grows out of the truth that people flock like sheep. If there were only three men in the world and two of them were left-handed, the third would fret his soul out because he was not like other folks.

When automobiles first came into use some one man of advanced ideas in each town bought a car, and it is safe to say that of the five next cars bought in that town, three were of the same make as the first. And it is not merely numbers that count in determining who shall be the bell wethers whom the others shall follow, but the matter of social position has also been a largely determining factor. There is, for instance, a certain make of car which has secured an immense sale through this very fact. As it happens this car is a splendid machine in itself, but no better than three or four other makes that might be named. Simply the "right people" bought them to begin with, and since then the dealers can't supply them fast enough.

Don't Use Poor Oil.

The use of a poor quality of lubricating oil leads to a diversity of evils, apart from inferior lubrication. Carbon deposits will form on the combustion chamber walls, on the piston head, and on the points of the sparking plug. Ignition will be interfered with and finally stopped through short-circuiting across the insulation of the plug. The deposit may, in time, become so thick as to hold sufficient heat from one explosion to another to cause pre-ignition, which is liable to cause the motor to run with more or less "knock." If pre-ignition is suspected a test can be made by cutting out the ignition current. If this fault is not present the motor will stop; but if pre-ignition is occurring the motor will run without the assistance of legitimate aids to ignition. Shutting off the supply of fuel will bring the engine to a standstill.

A Continual Rattle.

Sometimes some distressing noises, which seem quite unaccountable, proceed from the footboards of the driving seat. They generally take the form of an occasional sharp bang, though at other times they consist of a continual rattle, which almost leads one to believe that the footboards are loose and jumping about. As a rule, the noise is due to the levers of the pedals. Where these pass through the holes cut in the floorboards, it may be that the clearance, particularly at the back, is very small, and if the pedal lever is at all loose upon its bearing it will rock to and fro, and make a good deal of noise, which is often very hard to trace to its source, because when one stops the car and makes an examination it is usually impossible to reproduce the rattle.

A Dark Road Surface.

One source of danger has been developed with the somewhat limited use of the oiled or tarred road surface, which never was cause for complaint in connection with the hated dirt road. Its very dark color renders it hard to distinguish from the bordering grass or ditch when being traversed at night. The whitish appearance of the clay or macadam surface is comparatively easy to discern even on a black night. The remedy is slow driving at night and a good searchlight.

Look Out for Dry Metal.

A cylinder that is becoming overheated, either from a stoppage of the oil supply or any other cause, makes its trouble known by a scraping, grating noise at each stroke of the piston as the dry metals rub against each other. A loss of power can also be noted, and the driver should get down at once and ascertain what the trouble is. To keep on forcing the engine to run may mean a badly scored cylinder as well as a seized piston, and the many difficulties resulting therefrom.

AUTOMOBILE DEALER AND REPAIRER

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ADVERTISING RATES MADE KNOWN ON APPLICATION.

NEW YORK, SEPTEMBER, 1908.

Missing Numbers—Our readers are requested to remember that it always gives us pleasure to re-send numbers which have gone astray in the mails.

GROSS RECKLESSNESS.

Steam railway locomotives run on graded tracks; they run on tracks that have no sharp turns; they run on tracks where no other vehicle or thing passes in either direction; they run on tracks where both rails are level except at turns, at which the outside rail is the higher to overcome centrifugal force; they run on tracks with flanged rails so that the wheels are not easily lifted; they are run by trained engineers who are perfectly familiar with every turn and grade of the road.

Automobiles are run on the public highways where all manner of vehicles, persons and things are liable to be met; they are run on ungraded highways; they are run on highways that have sharp turns; they are run on highways that are almost invariably higher on one side than the other; they are run by those who are unfamiliar with them; they have absolutely no appliance to keep them from overturning.

With all of the safeguards provided to prevent railway accidents the average speed of railway trains is not over thirty-five miles an hour.

With the absence of almost all safeguards for preventing accidents, automobiles are run from twenty to fifty miles an hour.

Is it any wonder then that so many accidents should occur? Nor is it any wonder that the public has grown to feel desperate on this matter, and that automobile clubs are beginning to deal with the question in a way which will appeal to all sane users of cars. On Long Island threats are being made to send the reckless speeders to jail. At a recent hearing there statistics were presented concerning fatalities in which they were divided into four classes—murder, homicide, suicide and assault with intent to kill.

On the other hand, it is well known that the reckless car drivers and those who violate the law are not more than 10 per cent. of the whole. But the other 90 per cent. must suffer in consequence if something cannot be done. In many places country people are simply boiling over with indignation, and while they recognize, as well as others, that not all car drivers are to blame, they do not see any way to preserve their lives and lives of their children and property except by the severest punishment of the offenders and by imprisonment rather than by fine

PRICES ARE NOW LOW.

Those who defer purchasing a car with the thought that they will soon be cheaper will probably be disappointed in so far as this applies to those that now sell for, say, $1,500 or less. In the case of the large and high powered touring cars selling for from $2,500 to $6,000 there is a chance for lower prices, but runabouts and the various buggyabouts as a rule already sell at low figures. Indeed, it is reported that one manufacturing firm that fixed the price for runabouts so low two seasons ago, has made far too little profit on sales, and has been obliged to get square by asking exorbitant prices for parts and accessories.

To compare the cost of an automobile with that of a horse drawn vehicle is manifestly unfair. The automobile is subjected to many times greater strain than the horse driven carriage. In the matter of speed alone, the exertion or force put upon it is so much greater than that put upon a horse-drawn vehicle that its requirements of strength and stability should not be mentioned in the same category. Furthermore, the horse-drawn vehicle is not called upon to bear the weight of its own motive power as is the case with the automobile. Suppose the ordinary carriage had to carry the horse in addition to the passengers, how long would it last, or rather, how much would it be necessary to add to the strength of it? But this is just what the automobile must do, and it must do it with the addition of far greater speed requirements and a far more rigid propelling force.

A vehicle that can be purchased for $700 that will carry three persons at a speed up to forty miles an hour, in addition to the weight of its own motive power, and that will wear for years without much expense for repairs, is about the cheapest and most wonderful thing that mankind can secure.

IN UNIVERSAL USE.

The automobile is coming into more universal use than its most ardent advocate could have rationally foreseen a few years ago. It may not be strictly correct to say that it is revolutionizing life in the country, but it is making some radical and interesting changes there.

In the State of Connecticut the highways are good, bad and indifferent, and mostly bad, while the hills are far more formidable than is usually imagined. Yet in a recent rather comprehensive tour over the State the writer met far more automobiles than horse-drawn vehicles, while the signs, "Gasoline for Sale," at farm houses were extremely frequent. Nor are most of the cars that are met owned by residents of other States. They are usually the property of the residents, well-to-do farmers, the wealthy city dwellers and professional men. They may be met in the most out of the way places—on the hill tops, in the valleys, and far from the main traveled roads. Even in that State of poor roads, hills, and sandy stretches, they are an economy for all classes and not an extravagance or a luxury.

Our purpose in calling attention to this is to urge upon dealers and repair men the necessity of keeping abreast of the times. Do not for a moment imagine that the use of the automobile is to be either transient, partial or a fad. It is coming into universal use remarkably fast. You should not fail to recognize this fact and make your preparations accordingly.

LESSONS FOR DRIVERS.

Carelessness and Ignorance Responsible for Most Accidents.

Several accidents have occurred during the past month while cars have attempted to pass other vehicles going in the same direction but at a slower pace. The car comes up behind a horse-drawn vehicle quickly, and often, without looking ahead, begins to pass at the left. Meantime, another vehicle is coming in an opposite direction and also attempts to pass at the right of the horse-drawn vehicle, which somewhat obscures the cars approaching from opposite directions. Immediately they are upon one another, and quite likely there is not room for the three vehicles to pass, side by side. A collision is almost inevitable. No driver should attempt to pass another vehicle unless he sees clearly everything that is ahead of him. Nor should it be forgotten that while going rapidly the front wheels respond to the steering gear far sooner than the rear ones, and the driver may imagine he is out of the way of a passing vehicle when the rear part of the car is sure to strike it. This was probably the case in an accident in Northampton, Mass., where two men were thrown from their wagon and seriously if not fatally injured. The driver stoutly maintains that he did not hit the wagon at all, but those who witnessed the collision say it hit the wagon a glancing blow on the rear and hurled the occupants into the road. Then the car sped away toward this city with the four women who occupied the rear seats talking as unconcernedly as if nothing had happened, and later the same car returned over the same road without the occupants paying any attention to the injured men, who were then lying on the grass and were being attended by a doctor and others.

Concerning the accidents at railroad crossings, which have been unusually frequent of late, the blame is about equally divided between car drivers and the railroads. In some instances no flagman was present, particularly on Sundays, and in rare cases it is safe to say that no bell was rung at crossings, although the law clearly provides for this. On the other hand, locomotive engineers know all about the road they are traveling and thoroughly understand the engine they are driving, something that cannot always be said of the driver of the car. The approaches to grade crossings are not usually marked sufficiently plain to insure attention from a rapidly moving vehicle, and in some cases cars have been driven right through the flimsy shut gates.

Ralph Peters, president of the Long Island Railroad; Alfred J. Eno, president of the Long Island League, and A. R. Pardington, chairman of the good roads committee of the Long Island Automobile Club, have agreed upon a plan by which they hope to prevent accidents at grade railroad crossings.

The plan agreed upon is to construct a hummock about one foot high in the road on either side of a grade crossing and 150 feet from it. The plan has worked successfully in the village of Babylon, where all other methods to stop speeding had been tried in vain. President Eno of the Long Island League, who suggested the hummock plan, declares that drivers of automobiles would be compelled to stop or run the risk of a breakdown. He says even the most daring generally paid their respects to these hummocks and the ultra reckless must be regarded as a negligible quantity. Mr. Peters maintains that flagmen at grade crossings are practically useless. He had men stationed at dangerous points at many crossings, and chauffeurs, instead of being deterred by these men waving red flags, seemed to be infuriated by them and dashed over the grade crossing all the more recklessly. President Peters says that the Long Island Railroad would pay half the expenses of constructing these hummocks if the city or townships or other authorities in charge would meet the other half. He thinks a few experimental hummocks could be constructed, and if they worked well others could be constructed. The danger of a breakdown, especially the snapping of the springs of the car, would be a warning to these drivers. By slowing up the driver of the car could look around, and he would notice any train if it were approaching. "If a chauffeur would not stop for these hummocks he would not stop for a moving train, even if he saw it coming, and there was likelihood of an accident," he said. President Peters said that there were 429 grade crossings on the Long Island Railroad. It would be impossible to place a watchman at every crossing, and even if the railroad company incurred this expense it was shown that these watchmen could not prevent reckless drivers from passing them.

Mr. Peters says there are almost as many accidents on roads bisecting each other as on the grade crossings. In some instances rank weeds and grass grow to such a height that the drivers could not see over them and cars thus came together full tilt. He said he would have all the rank weeds, trees and tall plants cut down at the approach to the dangerous grade crossings and take such other steps as will obviate accidents.

It is generally understood that the prime cause of so many accidents at grade crossings is due to a disinclination on the part of the chauffeurs—and of drivers who do not consider themselves chauffeurs—to shift the gears of the car to make a start after a dead stop.

In most cases of accident at present drivers seem to have what they consider a good excuse ready. Near Minneapolis, Minn., a woman was killed and three persons were injured by a car running over an embankment while being rapidly driven at night. "The machine seemed to go crazy all at once," explained the driver. But automobiles never go "crazy." Upon rare occasions, and when not properly cared for and overlooked, something may go wrong with them, but in such cases there is never any danger unless they are being dangerously speeded. In the case in point the car skidded and ran off a 12-foot embankment. There was nobody or thing to blame but the driver.

It is not often now that accidents occur from cranking; but at Toledo, Ohio, the other day, a man was cranking his car when it started before he could get out of the way, crashing into a telephone pole which pinned him so that he was dangerously hurt. It need hardly be stated that the accident was the result of pure carelessness.

On the other hand, it is claimed that such hummocks are unlawful, and if they injure a car the town will be liable for damages.

It is time to call a halt in the general custom of using the highways for playgrounds for children or as runways for live stock and poultry. Pedestrians can walk by the roadside with far greater comfort and convenience than in the middle of the road; but there is a trait in some human natures that delights in always exercising their prerogatives. "The roads are as much mine as anybody else's," they assert bumptiously, and this is true. But it is also their duty to interfere with others as little as possible in the exercise of that right. We have seen pedestrians compel automobilists to give them half of the highway when the side path would have served their convenience far better. Not all the unfeeling wretches in the world are car drivers, by any means. Let us give the devil his due, no matter in what guise he may be found. The car driver sees a pedestrian in the road beyond; he sounds his horn as the law requires. But he knows no more than the man in the moon which way the

pedestrian will finally turn, and quite likely if in passing he goes within a foot of the walker there will be a howl or a frown.

We often hear it stated that in the case of a wide level road which gives a good view of the country on both sides there is little danger, no matter how fast the car is speeded. Suppose there is a mud hole or a big stone in the road, or a soft spot of sand, neither of which can readily be seen? It simply results in an accident, the effects of which are liable to be far more serious than if the car is proceeding much slower on a so-called dangerous road. In Wayne county, Pa., recently a car was speeding rapidly along under conditions as stated above. It suddenly struck a mud-hole, upsetting and throwing the occupants under the machine and down an embankment among sharp stones, rocks and logs, near the edge of the river, and the machine was kept from going into the water by a clump of bushes. The automobile turned turtle, and a little eighteen-months-old child was found pinned between a rock and the steering gear of the machine. His head was in a wedge shaped rock and that saved him from being killed. Another passenger was thrown over the front seat of the automobile and two bones were fractured in her arm.

Insulated Wire.

Notwithstanding the high price often paid for insulated wire, the quality is, as a rule, far lower than ought to be put into so important a part of the car's anatomy. It is usual to find the lowest class of rubber used for insulation, if rubber is used at all, although this material should be almost of the very best. In one respect that quality of rubber used for tobacco pouches would be ideal, and that is in point of elasticity, but unfortunately this very highest grade suffers from the disadvantage that in cold weather it hardens, and is liable to crack. A very slightly lower quality is more suitable for all round good results, and certain grades of the red variety frequently used by analysts in the form of tubing are perhaps the best of all; not forgetting, however, that there is plenty of veritable red rubber rubbish. An excellent plan is to buy any ordinary low tension wire that contains plenty of good wire at the core, and to protect it by pushing it into some good rubber tubing, obtained from the firms who deal in chemical laboratory apparatus. Of course the diameter is chosen so as to be suitable for the low tension wire, and if the fit is somewhat loose it is of no consequence. In this way we can crowd the outer tubing on to the wire so that when the terminal has been attached, the rubber tube will spring itself well over the terminal joint and give a most effectual and neat protection. The "insulation resistance" of the rubber tube referred to is such that, although the completed cable may not be quite as thick as ordinary high tension cable, it will answer the purpose just as well, and probably better.

Magneto Tips.

A number of magneto contact breakers gradually lose efficiency through wear on the ball heel of the bell crank carrying the moving platinum point, and on the fibre cam, ring, or roller, as the case may be, which actuates the aforesaid bell crank. There is a simple cure for this derangement which obviates the purchase of any new parts. The *fixed* platinum should be unscrewed, and with a fine file a sixty-fourth part of an inch should be taken off its bed. This corrects the timing of the contact breaker, but increases the gap between the points. The gap may then be corrected by inserting a very thin washer beneath the platinum point on the bell crank. Care should be taken not to reverse this process by sinking the platinum on the moving crank, and raising that on the fixed part of the contact breaker, as in this case the amount of break would indeed be safeguarded, but the timing would be made worse instead of better. The defect of this adjustment is that when new parts are at last required the fresh fixed platinum point will need packing up to the original height, a detail that may easily be overlooked. Care in the fitting of new magneto contact breaker parts is always requisite, as patterns are continually changing, and a very minute divergence in the shape or measurement of contact breaker spares will affect the ignition timing. The date and number of the magneto should always be given in ordering replacements, and we have often found that even this precaution has not availed to secure spares exactly corresponding with the parts scrapped. A minute comparison is therefore always advisable.

Oil Pump Washers.

Some cars are fitted with hand oil pumps, and these are usually filled with similar washers to tire pumps, but there are usually two washers in the former fitted back to back, the top one insuring a better suction. Since the washers in oil pumps are practically always in contact with a fairly thick oil, it is seldom that trouble is experienced through the washers becoming dry and stiff and failing to make even contact on the sides of the glass or metal barrel in which they slide. Still it is sometimes found that the oil refuses to be drawn up into the pump barrel, in spite of the softness and pliability of the washers. The trouble can often be traced to the washers being too pliable, preventing sufficient pressure on the barrel. An ideal washer should be fairly stiff except at the edges, but this desideratum is impossible on account of so much oil soaking into it. This being so, some means of supporting the washer must be resorted to. I have made a refractory hand oil pump work satisfactorily by fitting a thin metal washer inside the hollow portion of each leather washer. The metal washers should be as large as possible without disturbing the pliability of the edges of the leather washers. Roughly speaking, the metal washers should be about half the diameter of the inside diameter of the pump barrel. The best method is to choose washers too large and reduce their diameter by degrees until it is found that the leather washers will enter the pump barrel and move up and down fairly easily. A pump once treated in this way will last indefinitely. It is, perhaps, needless to point out the importance of inserting leather washers in the barrel in such a way that they do not cockle up. If one side is just pushed in first the other half can be eased in with the blade of a pocket knife.

Effect of Weight on Tires.

The distribution of weight—more than the actual weight of the automobile itself—counts in tire endurance. This fact is being proved daily in Europe, where the leading makers are following the suspension system. A man's weight has little to do with the wear on the soles of his shoes. It's the way he walks—the weight-bearing angles of approach and the sustaining power. The suspension system saves tires simply because the weight of the car is balanced properly on the wheels, and allowance is made for speed wear. So that friction (which, more than car weight, wears out the tires) is reduced to a minimum. Every angle that carries or deflects weight is carefully calculated, and the result is the same as the difference between a man who is "slouchy" on his feet, and, therefore, hard on shoes, and a man who puts his foot firmly on the ground, wearing his shoes twice as long.

Should a carburetter catch fire through a back shot, the fire may occasionally be extinguished by turning off the gasoline and racing the engine.

THE REPAIR SHOP

AUTOMOBILE BODIES.

Building One with a Two-Bow Top for a Runabout.

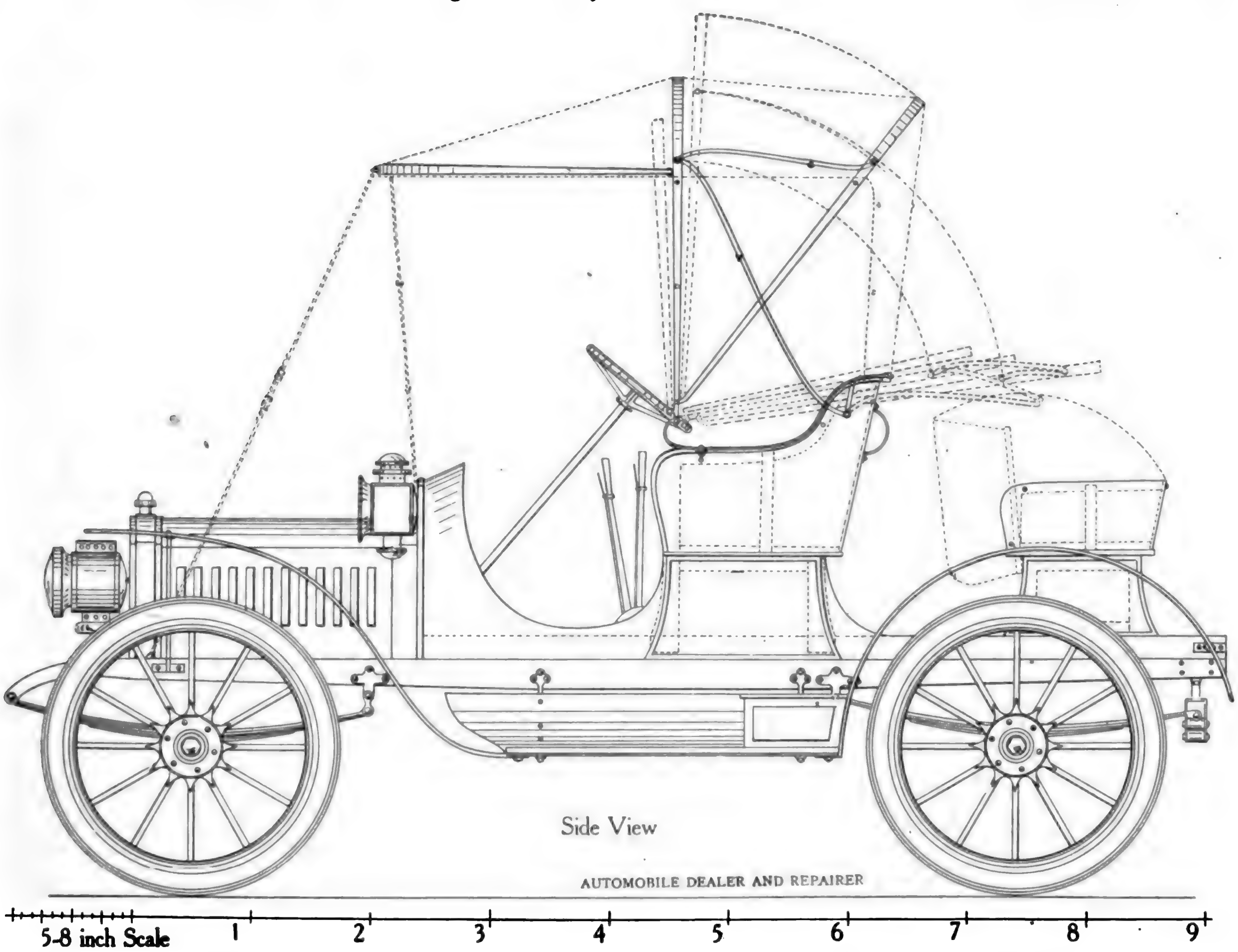
Drawn to ⅝-inch scale.

Before drafting the body the designer must have the width and length of the chassis. The widths of a chassis range from 30 to 35½ inches, but those built on runabout bodies are generally from 30 to 32 inches, which is a very convenient width, and a well-proportioned body can be built on it. It is different with the length, as many chasses are used for runabouts on which different styles of bodies were originally built, but had been discarded, consequently the draftsman or repairer must use his best judgment to give the required foot room and a comfortable seat, but in most cases the doors will come in contact with the fenders. For instance, the owner of the automobile has a runabout chassis on which the distance from dash board to center of rear wheels is 5 feet; or same size as the one illustrated on side view. On this machine he wants built a very short and light limousine body. If the front seat is shifted so that the floor room is 21 inches only, the door will still interfere with the fenders. Several ways are open to obtain more space; one is to move the fender further toward the wheels and springs rearward, but in the majority of cases there is something in the way which will prevent any changes.

For a single rear seat, as in this design, the rear position of wheels may be all right, but a double seat the length from dash to rear axle should be 5 feet 6 inches.

The wheel base on this chassis is 7 feet, and height from the floor 24 inches, which is a very convenient height. The space from dash to front edge of the seat is 24 inches on this body; the front seat frame is 18 inches, and the space between the rear of the seat frame to the front edge of the rear seat is 16½ inches.

To make a perfect riding car the rear seat should be three inches further toward the front. We make this statement to show that it is not advisable to have the front of the seat beyond the center of the axle. In case the width across the chassis is only 30 inches and a wide seat is required the body should have inclined sides; that is, be wider across the top than across the bottom, or made concave, spreading outward on top, to prevent the seats hanging too much over the sides of the body.



CONSTRUCTION OF THE BODY.

Dress the sills 1¾x2¼ inches square, cut a rabbet ¾x ¾ inch on the upper inside edges from the bottom boards up to the rear seat where there is a cross bar. Beyond the cross bar the bottom board is sunk so as to increase the space under the seat. That part back of the rear seat is closed up with a ⅜-inch panel.

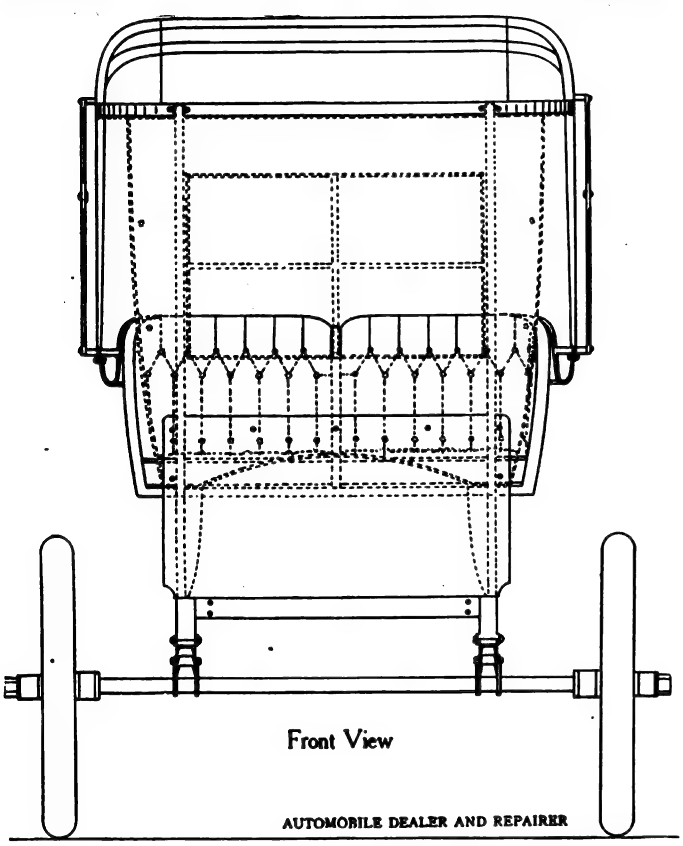
The body under the front seat is framed square up. Its pieces are shown by dotted lines and covered with 5/16-inch panels. The part under the seat is made separate from the body and all sides are concave. The fram

ing is shown by dotted lines on the side and rear end, but the front is finished with a lid. The three sides are covered with ¼-inch thick poplar panels. The front seat is framed as shown by dotted lines on the side and rear view, and the seat frame is lapped by using ¾x3½-inch pieces. The shape of such seats can be seen in the July number, including also the rear seat, which is framed with panels up and down. The rear seat on this draft is built without a seat frame, has frame work top and bottom and screwed, when paneled and finished, against the board. The board is ¾x15 inches, is kept from warping by the seat and is hinged in front so that it can be turned as shown by dotted lines. At the rear end is a lock, so that it can be locked, which is better and more simple than two straps.

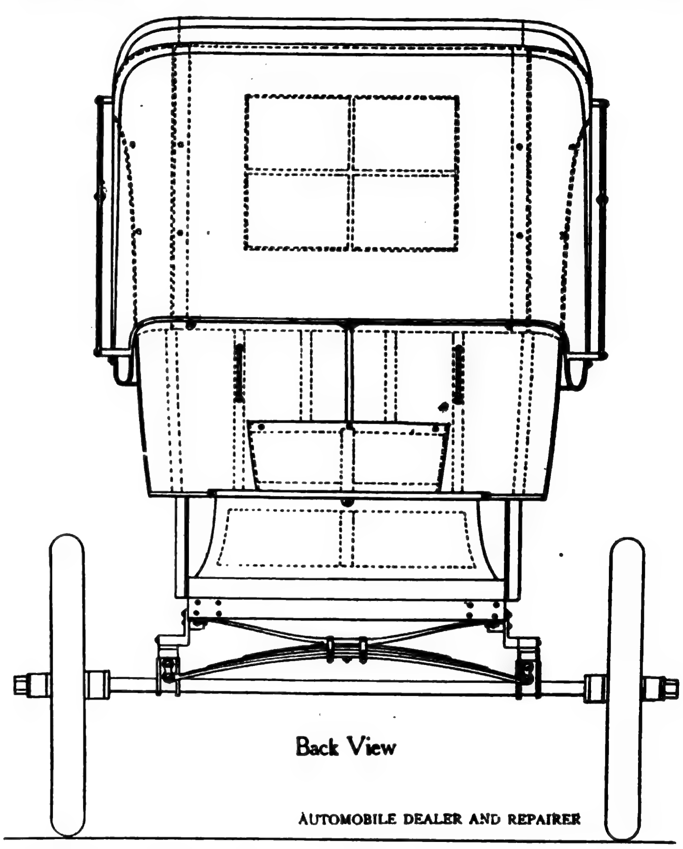
THE TWO-BOW TOPS.

The two-bow tops are new and need some detailed explanation. In fact, there are three bows, two up and down and the third is in a horizontal position. The object in view is to turn the front bow from the regular three-bow buggy top into a horizontal position to obtain a clear entrance without any obstruction and to extend the top further front. A regular three-bow buggy top is not over 44 inches long, while this top is 55 inches, or 11 inches longer than a buggy top. The rear length is 25 inches from the rear end bow to center or vertical bow, and from this center to the front end 30 inches, making the length of the top 55 inches in all. The amount of rake is 3 inches and the distance from slat-iron center to the rear prop is 17¼ inches. The position of the prop is 1 inch higher than the slat-iron center and has a drop of 3¼ inches from the shifting rail. The shifting rail. on account of the difficult fitting around the seat, is made of five separate pieces and each is fitted separately and then welded. As shown on this draft the rail is level with the top of the seat and the space between the seat and shifting rail is ¾ inch. The width of the top is 48 inches and the width of the body is 43 inches, consequently the slat-iron part must be turned outward to meet the width of the bow as shown on the back view. The horizontal front bow is the same shape and width as the other two bows and is fastened to the center bow with a loose pin, so that when the body is dropped as shown by dotted lines the bow is moved outwardly on both sides and put in two holes near the slat-iron. This bow is prevented from slipping out of the holes by small ⅛-inch pins which are fastened to small chains stationary to the front bow, to be always on hand when needed.

If it was not on account of the weak shifting rail prop, the horizontal top joint would not be needed, but as the main top joints are too weak to hold the top up, the horizontal ones in connection with the main ones will keep the top in a more solid position. The top joints are made straight and curved. The curved ones look better when the top is up, but do not look as well when the top is down, as shown by the dotted lines. When the top joints are straight and the top is down, the top joints should run parallel with the bows. The top must be besides the top joints held up with two straps in front, because the front part of the top is loose, and would lift upward in running against the wind, when run without the roll up wind shield. Such a top with roll up rear and side curtains, including the roll up wind shield with its celluloid lights in each, makes a very desirable and handy top, and a great improvement over the regular three-bow buggy top.



Front View



Back View

Pantasote or any other of the artificial leathers are used to cover the top and also for the rest of the trimming. The back stays are cut about 15 inches wide on top and shaped as shown on the side and back view. On the back view the edge is vertical, while on the side view it is curved, starting from the lower edge of the side quarter and rear end of the bow, and tacked to the bow, including the side quarters, similar to a buggy top. The width of the back curtain is 36 inches, and laps over the stays 1¾ or 2 inches each side, and the back stays are about 8 inches wide at the lower edges, and its length is 1½ inches below the shifting rail, including also the back curtain.

The celluloid light in the back curtain is 15x21 inches and the strips across are pantasote strips sewed on, or the four spaces can be cut out of the goods. The back curtain is tacked stationary to the rear bow, and has three roll up straps, which are necessary to hold the curtain in position when rolled up. The back stays are riveted to the shifting rail. The lights in the side curtains vary in shape and size, but the larger ones are preferred. The size of side curtains should be 12x12 inches, but when made that size they will cross the bow, which is objectionable; consequently the three-cornered lights are preferred. These curtains are fastened to the bow back stays and body with curtain fasteners. The front side curtains are fastened to the bow at the top edge, to the storm curtain front and to the vertical bow.

The storm curtain front is fastened inside of the front bow on top, and to the dash board at the bottom as shown on front view. The width across the bottom is as wide as the dash board and on top 42 inches, cut to a curve on each side as shown by dotted lines. On top the front is fastened with four buttons and at the bottom with seven buttons, same as used for the rear and side curtains. Most trimmers cut the edges of this front straight, but they look far better with curved edges. The light in this front is 18x30 inches and has the same finish as the back light.

Through the storm curtain front is shown the tufted trimming of the twin seats and cushion fronts. Those seats are generally from 18 to 20 inches deep and the width across as shown. The cushions are made on wood frames about 1½ inches smaller than the actual size of the seat. The depth of the seat frame depends on the depth of the body. Some racing bodies are built with sides 7 inches deep, consequently from 4 to 5 inches deep cushion frames are used. Each cushion has nine springs and seventeen buttons. The cushion fronts have one-inch wide raisers, and are made without falls. The small back cushion is made similar to the twin cushions, on a frame same depth, but has a smooth top with five buttons only. The carpets front and rear are well fitted and fastened as usual.

THE PAINTING.

Carmine predominates, but other colors are seen and look pretty. To help the painters we will give some of them. Medium carmine for seats, without any striping; hood carmine, and body black; molding and dash board carmine; fenders black and gear carmine. Seats, Brewster green striped, a fine black line around the edges of moldings; body, either black or Brewster green; when black, make moldings green, striped black; when green, make moldings black striped green; gear, Brewster green striped black including fenders. Seats, body and gear carmine set off with black; the same is seen with green of various shades, but generally striped cream color.

FINISH OF BODY AND GEAR.

Polished brass, or gold electro plated, fittings still predominate, but the tendency is for a change toward more somber colors. Black lamps with brass edges are seen on high-class work, and handles covered with morocco in the same color as the trimming, and the gaudy appearance will be discontinued.

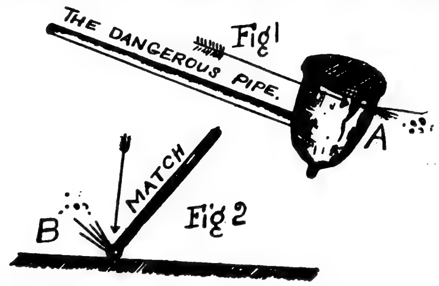
Action of Brakes.

Many complain of the incompetency of the brake action of their cars when there is really nothing wrong with the brake itself at all. It may so happen that, by reason of frequent adjustment, the lever or pedal may reach the end of its travel and ceases to go any further—though the bands are not in action at all. Or the linkage may be so adjusted that it comes into contact with some portion of the frame, or some part of the transmission, without giving the brakes a chance to work at all.

GASOLINE EXPLOSIONS.

How They Occur in Garages and Repair Shops and How to Prevent Them.

Recently there have been quite a number of explosions of gasoline tanks during the process of repair work on motor vehicles. It is very annoying, dangerous and expensive to have a gasoline tank explode in your shop. First of all, there is the danger. The workmen in the immediate vicinity are liable to get blown against the benches or sides of the apartment with sufficient force to break a limb. They are liable to get their faces and hands burned with the sheet of flame which usually shoots



forth with the explosion. The interior of the shop may get injured more or less, and perhaps set on fire, so that the fire department may be called out and your shop with the contents will be drenched. Then, in addition to this is the liability of the destruction of the expensive motor vehicle. You may be skilled at repair work and able to substitute a new gasoline tank, but you will hardly be able to restore the bent and twisted parts of the damaged car to its original condition and satisfy the owner. The owner is likely to demand a new machine or the cost of the injured one, and your profits on the year's work may be eaten into to considerable extent.

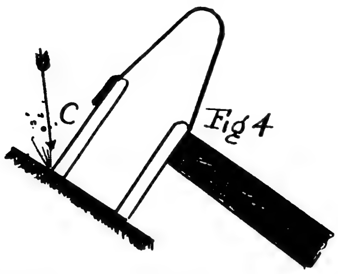
Still, the gasoline tank explosions occur. We not only read occasional newspaper notices of the same, but come into personal contact with such events.

The writer has conversed with various interested parties concerning explosions of gasoline tanks during repairs. Almost invariably they will tell you that the cause of such and such an explosion was due to the workman smoking or through other carelessness on his part. On

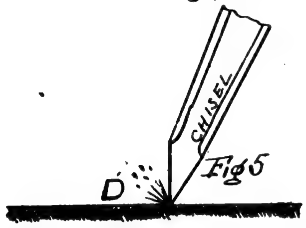
the other hand, if the workman or workmen are spoken with on the subject, they will blame the explosion to defective machinery, inferior equipments, improperly adjusted tank fittings, poorly arranged lighting facilities of the shop, in case lights were used at the time, and so on. Upon personal investigation the writer found at least one instance in which an explosion was caused at the gasoline tank of a motor car during repairs because of cracks in a clay pipe smoked by a workman. The pipe is shown in Fig. 1, with the crack at A. Ignited embers of the contents fell from this pipe to a point near where the vapors of the gasoline were escaping from a detective tank and caused the vapors to take fire. The flames were communicated to the tank and the tank blew up. In another instance practically the same accident occurred, due to a

workman striking a parlor match, as in Fig. 2, causing ignited pieces of the head to fly out at B to an exposed portion of a gasoline tank in operation of fixing, setting fire to the oil and causing quite a panic.

Of course one may find evidences of carelessness on the part of the owners of the shop. In a certain repair shop, where there were a number of gasoline tanks in process of repair, I noticed a common tallow candle stuck into

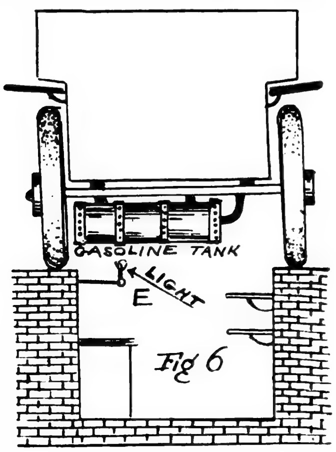


the wall, as in Fig. 3. Gasoline sends forth its vapors quite a distance, and it is not infrequent that the line of vapor ignites and conveys the flame to the body of oil in the tank, causing an explosion. Again, tanks have been exploded by sparks caused by striking metal parts, as at C, Fig. 4. The sparks contact with the inflammable stuff and a fire and explosion are the result in quick time. Then you can find workmen so industriously plying the cold chisel that sparks are sent flying into space as at D, Fig. 5. The fact seems strange, but it has happened.



Usually the sparks fly only from chipping hard metals, such as steel, brass, etc. Still, you can get some good sparks from the softer metals. If the sparks fly into gasoline or gasoline vapors, you are going to have a fire, and maybe an explosion.

The other day I saw a car backed in over a pit, as in Fig. 6. The pit was nicely fitted with benches and repair devices, so that the workman could stand erect below the car and make necessary underneath repairs. But upon examining the light, this was found to be directly below the gasoline tank of the motor vehicle, as shown at



E. I wondered how long the heat of the jet could boil the gasoline in the tank without an explosion. The workman went coolly at his labors. I could see the sizzle of matter on the cylinder. I called the man's attention to the danger. He only laughed and finished the job he was on, then pushed the car forward so as to make the tank clear the heat of the jet. I think that there would have been an explosion in a few minutes more time.

THE PAINT SHOP.

The Action of Varnish Upon Automobile Surfaces.

BY M. C. HILLICK.

To the painter engaged in repainting automobiles no less than to his brother engaged in painting new ones, this topic is of vital concern. To the jobbing shop painter it is especially important, since he is dependent upon the grace of the auto owner for prosperity or adversity.

The action of varnish upon automobile surfaces cannot be counted upon with the same certainty as it may be upon the horse-drawn carriage, where the surfaces are of smaller radius and subjected, generally speaking, to a milder form of service.

Its action, of course, depends very much upon whether the surface is regularly washed, or, in fact, washed quite as often as it becomes smeared with mud or other road refuse. Mud, and markedly city mud, is a rank enemy of the auto varnish. It and the mud of lime districts and of clay localities are especial enemies of varnish. When touring along these highways while they are wet the owner or chauffeur should be taught, and the painter can well afford to be the teacher, to have the surface washed immediately upon its return from the run. Under such treatment the varnish does not suffer much damage, if at all, under the temporary activity of the absorbent soil.

Mud absorbs, by a sort of capillary attraction, both the oil and the gum constituents of the varnish, and the greater the percentage of ammonia present in the mud, the greater the power of the mud for the extraction of the necessary virtues of varnish.

Because of this ever present danger the painter should make it a point in his policy to thoroughly inform his customers in regard to this matter.

Highly elastic varnishes, such as are extensively used upon automobiles, by reason of their possession of a greater quantity of oil, are more sensitive to the action of mud than the hard drying varnishes. But all varnishes are to some extent, and promptly, acted upon by mud. Moreover, when traversing dry roads or streets the action of auto varnish is directly incited by the mass of highway dust accumulating upon it. Perhaps this dust and dirt becomes moist, if not positively wet, when, naturally, the suction mechanism of the soil is set in motion to the undoing of the varnish. Therefore, the painter may well preach the gospel of daily water baths for the auto daily in use. Such baths, if properly administered, increase the lustre, prolong the life and contribute to the general good looks of the varnish.

The automobile surface of varnish, by reason of greater area upon which there is logically greater strain, must be at some stage of its life subject to cracking and splintering. Reasonably enough, all varnish cracks when it grows old and less supple. For reasons which we are not always permitted to know, varnish sometimes fissures prematurely—chiefly because there is just now a mania for rushing the auto through the paint shop at an unlawful speed. Coats not permitted to dry properly, be they paint, color or varnish, are particularly subject to the cracking disease. Lack of uniformity in the selection of varnishes, as for example, choosing for the same surface both hard drying and elastic varnishes. In such a practice there is clearly developed an antagonism which works swift injury to the finish.

Force cracks or fissures come from service strains upon

the auto surface, and are not chargeable to the painter's account, although not infrequently credited to him. The painter has no license for not recognizing force checks upon sight. They appear upon the surface in long, sweeping and invariably circular lines.

The storage or housing of the auto has much—and we might almost say everything—to do with the real durability of the varnish. Storage quarters should be absolutely free from ammonia contamination. They should be dry, and capable of being kept dry, regardless of weather conditions. Provision should be made for heating the quarters if necessary. Ventilation is no less necessary, and should be provided at all times. Varnish thrives upon pure, fresh air, quite like the painter. The latter's duty is to inform his customers of all these things.

IGNITION TROUBLES.

How to Locate Them and How They May Be Corrected.

BY SYDNEY F. WALKER.

(Continued.)

Testing the secondary circuit is a difficult matter because of the resistance of the long length of fine wire on the secondary coil, and because of the spark gap itself. The case is again one for building up experience by testing the secondary coils which pass through the repairing shop, or any that come into the attendant's hands. It will be noticed that, tracing the connection from the spring X to the spark gap, it is continuous. Really, the two circuits, the primary and secondary circuit, are in what electrical engineers call series, but with a connection from the point B to the frame of the machine, and another connection from the sparking plug to the frame of the machine. As will be seen, the circuit takes the following course: From the spring X through the wire leading to one end of the battery, through the battery, through the wire S to the contact breaker, through the primary coil and the wire S' to the terminal B, then through the wire A' and the secondary coil to the wire A, thence to the terminal E of the sparking plug, to the platinum point K, across the spark gap to the other platinum point, to the frame of the machine. Hence a test can be made from point to point, continuously through the whole of the connections, providing that sufficient pressure is present to drive a current through the secondary coil. The difficulty here is, the ammeter will not show any deflection, if it is placed in the circuit, or so that the secondary coil forms part of the circuit, with only the ordinary firing battery providing current. The volt meter can usually be made to show a deflection, through the secondary coil, but it requires a considerably higher voltage than is present in the ordinary firing battery, and here is where the experience is to be built up by the attendant. Taking the volt meter that he has made himself master of, as explained in a previous portion of the article, he should take as many coils as he can obtain access to, disconnect their secondary wires from their terminals, or at any rate disconnect the end B from its terminal, and form a circuit with the volt meter, the secondary coil, and a battery, and put on as many good dry cells, or accumulator cells, as may be convenient, until he has obtained a good deflection, 3 or 4 volts, upon the volt meter. By testing with different coils he will get to know the number of cells required to give him an indication on the volt meter, through the secondary coil, and then if from previous tests it should appear that the secondary coil is at fault, he can either test directly through the primary coil or through the secondary coil as those previously explained, but the volt meter in this test will be used as the ammeter was used in the test of the primary circuit and of the make and break apparatus. Thus one end of the battery may be connected to the frame of the machine, the other end of the battery to one of the test wires of the volt meter, and the other test wire of the volt meter may be touched successively on the terminal screw E of the sparking plug, having first bridged the spark gap itself by a short piece of wire, then upon the wire A before it enters the coil, then upon the wire A' as it emerges from the coil, and lastly upon the terminal B, or the wire that is connected to it. The deflection on the volt meter when touching on the terminal E, providing that the spark gap is bridged over, will be the full deflection the instrument can show. The needle should be thrown violently over, and it will be nearly as much on the wire A, or the secondary terminal, before entering the coil. On the wire A' the deflection will be very much reduced. And here the tester should

FIGURE-2

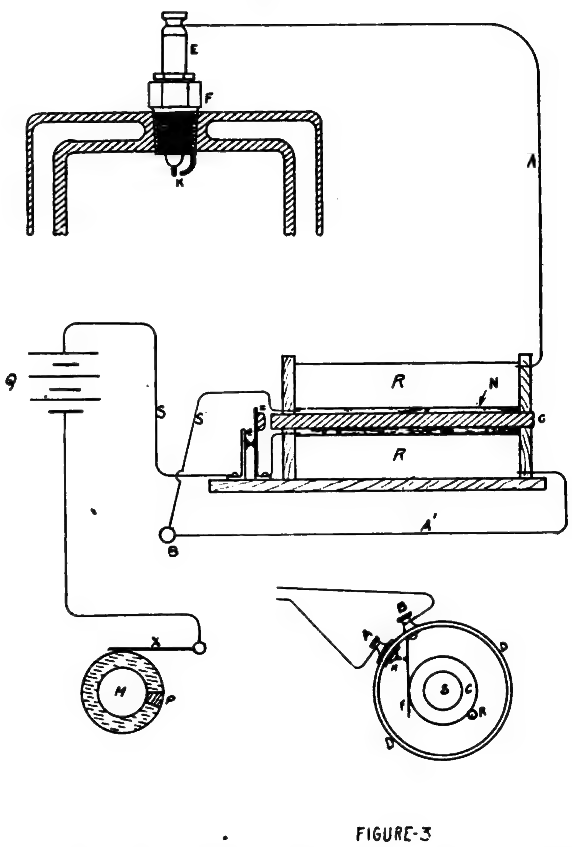


FIGURE-3

look out for two possible indications. If no deflection is shown upon the molt meter when touching the testing wire on the wire A', it will be an indication that the secondary wire is broken somewhere. Most probably the end of the fine wire that is connected to the shank of the terminal screw, inside the apparatus, is broken off. It may happen, however, that a joint in the wire itself in the body of the winding is broken. The secondary coils, particularly of induction coils, should be wound from one continuous length, but it sometimes happens that a wire breaks in the process of winding, and is joined up again, sometimes soldered, and in any case is rendered brittle in the neighborhood of the joint and breaks. The coil works for some considerable time, and then without warning it suddenly ceases, and on stripping the coil the joint is found to have broken. In some cases a breakage of this kind takes a particularly exasperating form. The broken ends of the wire will

be jerked apart by the motion of the car, and sparking will stop. A little later some other motion of the car will bring them together, and the sparking will go on again. This is what is known as an intermittent fault. The other indication the attendant should look for is the possibility of the insulation of the coil having deteriorated. The ability of the coil to furnish the necessary spark depends upon the number of turns of wire that are actively engaged in multiplying the pressure. Thus, taking the ordinary primary pressure at 4 volts, and the sparking pressure at 6,000 volts, the number of turns of the secondary coils should be approximately 1,500 times that of the primary coil. Great care is necessary with these high pressures to insulate between layer and layer of the secondary coil. Thus, assuming there are 60 layers of wire on the secondary coil, there is a difference of pressure between successive layers of 100 volts, and if there are only 30 layers of 200 volts. That is to say, there is a difference of pressure between any turn upon any layer and the corresponding turn of the layer above, and between it and the corresponding turn of the layer below, of 100 or 200 volts, as the case may be. If this pressure is not provided for, it may happen, and often does happen in badly constructed coils, that successive layers are connected together, so that in place of 60 layers or 30 layers there may be say only 40 or 20, with the result that with the same battery power the spark is very considerably reduced, and below the ignition point. The test mentioned above will show this. Supposing that a test has been arranged, with say ten dry cells in series, the volt meter, as arranged, and with the secondary coil of the type under test in circuit, the deflection of the volt meter should be say 2½ volts. If it is 3 volts the attendant should suspect something, and if it is 3½ or 4 volts he should condemn the coil.

The above will probably give those who have the repairing of ignition outfits the idea of how the problems are to be tackled, and they will also doubtless be able to devise other tests on the same lines. One rule governs all tests of this kind. When you have found your current and lost it again you have found your trouble.

INTERMITTENT TROUBLES.

The intermittent trouble, or the intermittent fault, as the electrical man calls it, is the most difficult to locate of any, because of its uncertainty. The only thing to be done is to try by shaking the different parts of the apparatus about, subjecting them to a fair amount of knocking about, to bring the fault on, testing from time to time, until it has come on. When it is on the above tests will enable it to be found.

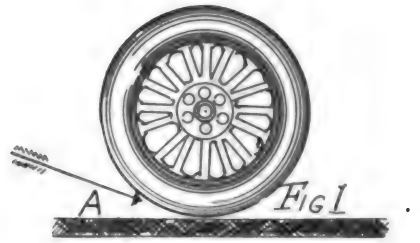
TESTING FOR SHORT CIRCUIT.

By a short circuit is meant a metallic connection between two wires that are insulated from each other, and that should carry the current say from the battery to the induction coil, or from the induction coil to the spark. Again, a short circuit is formed when one of the battery wires makes connection with the frame of the machine, or one of the wires from the secondary coil does. In the case of a short circuit of the wires of a make and break outfit, or the primary wires of a jump spark outfit, the fact will be known by the battery running down very quickly, after it is put in freshly charged, or with new cells, while the spark refuses to pass. It is there that the ammeter is so useful. If it is connected in the primary circuit, or the intermittent circuit, as explained above, it will show that a current is passing, immediately connection is made. Having connected the ammeter in the primary, or make and break circuit, proceed to pull the wires about until the deflection ceases, when the short circuit will have disappeared, and if the wires are examined it will be discovered that they have been damaged in one or more places. For the wires leading from the secondary to the sparking plug, and to the frame of the machine, if a connection is suspected, it may be discovered by disconnecting the wires A^1 and A from the terminals B and E, and forming a circuit with a battery, the ammeter, and the two wires A and A^1, and the secondary wire of the induction coil. If there is a connection between the two wires, or even if the insulation of the secondary coil itself is much deteriorated, a deflection will show upon the ammeter, and an examination of the wires will show the trouble, while by pulling the wires about it may be got rid of temporarily.

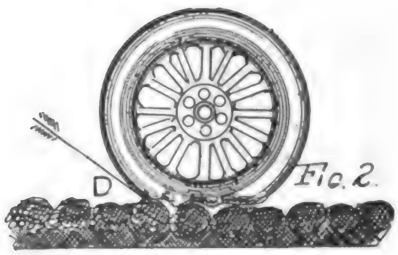
HARD USAGE OF TIRES.

And Yet Some Marvel That They Often Go Wrong.

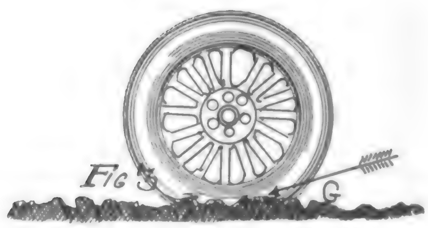
Many repairmen and dealers who send out cars do not consider the amount of wear and tear to which the average tire is put in the course of a single day's run. The result is that tires are often permitted to go out of shops in a weakened condition. I find that many make their calculations on the basis of a smooth surface for the tire.



They argue that the wheels are to glide over a hard, even road and that the tire will be up and firm. The condition exhibited in Fig. I illustrates what some men assume. They make themselves believe that the roadway is going to be a nice gliding, as shown at A. But they are mistaken. There may be miles of good, smooth concrete road, over which the car will run without an unnecessary



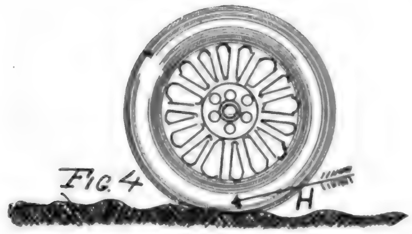
movement, but the chances are that there will be mud holes, loose gravel and paving blocks, tilted stones and the like to contend with as well. A complete run of the automobile will tell the story. Hence we must take into calculation the fact that the rubber material is going to be compressed at every turn of the wheel, even on a smooth



surface, due to the weight of the car. We have got to take into consideration that this constant squeezing and releasing of the rubber and the general mechanical struc-

ture of the tire is going to do damage as time passes and the car is constantly operated. Hence, after a certain period it is wise to examine the structure of the tires, interior and exterior, and head off a breakdown before the car goes out. It injures the trade to have a car hauled back by a horse. It is damaging to see abandoned automobiles along the road, with evidence that the occupants had to ride back on the street or railway cars. It is better for the automobile sales and repair business to check the breakdowns by getting in ahead of the weak parts. This is done in some shops and renting establishments. It is not done in others.

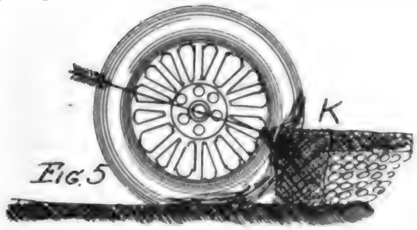
In some cities and towns there are roads paved with blocks in which the composition between the blocks is partly gone, due to long use and washing out. Every time the tire goes over a paving of this kind the exterior



is partly depressed into the grooves. This of course is detrimental to the tire, and tires subjected to paving of this order should be examined every time the car is returned.

Again, there are cases in which the cobblestones are rounded and full, resulting in a rumperty motion imparted to the wheels, all of which does its part towards making the life of the tire a little shorter than if the tire were used on a smooth, soft country road. If there is a weak place in one of the tires, and if this weak place strikes a block obstruction, it will be the finish of the tire. Not infrequently there are roads in the locality in which there are abrupt obstructions like D, Fig. 2.

Almost always it is safe to assume that automobile tires are going to be subjected to about as much ripping



of surface as shown in Fig. 3 at G. This represents a surface after the muddy way froze over night. Numerous ruptures are made all with points. The surfacing in Fig. 4 at H gives a waving motion to the tire and is not liable to do much damage, although it may rock the car a great deal.

Of course if the machine is bumped into the curb the tire is damaged through an accident. No one can be expected to calculate what the accident is going to be. If he could, certain metal shields might be arranged to drop at the right time. So we consider the responsibility of tire endurance ends if the average condition of roads be taken into consideration and the tires are fitted to stand the tests accordingly.

When about to inflate a tire always give a few strokes of the pump before attaching it to the valve, in order to blow out any grit.

A frequent cause of overheating in modern cars, particularly on those where no pump is employed, is slipping of the fan belt.

Tests for Cylinder Oils.

Few motorists realize the importance of proper lubrication and the havoc which may be wrought by using an inferior lubricant, while many buyers are influenced by the matter of price, without considering quality, or are guided by the advice of a man who is interested in selling the goods on which he makes the greatest profit.

Much has appeared recently both in regard to substitution and as to the test which a satisfactory cylinder oil should make. Some of what has been written missed the point. The tests for the flash point, gravity and viscosity, while interesting to the practical chemist, are unnecessary as far as the consumer himself is concerned. The manufacturer of the several standard grades on the market would be glad to furnish these tests on application.

The determination of the amount of free tarry matter in the oil is the real factor which governs the amount of carbonization to be expected. The catch phrase "color test for carbon" has even been adopted by some manufacturers, meaning that lightness of color indicates freedom from carbon. This is a plausible argument and convincing to the unskilled user. It has arisen from the misinterpretation of the word "light" as applied to oils. While it is true that lightness of gravity is of the greatest importance, it is also undeniably true that lightness of gravity and lightness of color are not necessarily corelative.

The consumer should therefore be guided by the reputation of the manufacturer, and not be influenced by a few cents a gallon saved, which may mean many dollars spent later for repairs.

Clogging of Lamp Tubes.

The copper tubes used for connecting the generator and the lamps often clog, and in the course of a season or two they require attention. Most of this clogging will be found to take place at the ends and wherever moisture can accumulate. Water in any part of the pipes is a great annoyance, as it causes flickering of the lights, and the piping should throughout be arranged to drain the pipes toward one or both ends. It is better and generally easier to drain back to the generator, but in case this cannot be arranged the forward ends of the pipes may be cleared of water by disconnecting the rubber tubes and blowing through with a tire pump. Pipes found to be clogged may frequently be saved by cutting off an inch or so from their ends. Occasionally this results in small explosions, due to detonation of the acetylide of copper, which generally forms in the pipes, and it is well to keep one's eyes and fingers out of range of the ends of the pipes while the sawing or cutting is going on. A few car makers use a larger than standard size of tubing for this work, the aim being to avoid clogging by small particles. Some repairmen clean these pipes by forcing water back and forth through them, which is correct, provided the proper means are followed to get the water well removed from the pipes after the cleansing operation is completed.

Every owner should possess a plan of his wiring system, and carry it on his car. If one is not supplied by the makers, he should draw out one himself.

If a crank case gets unusually hot, it is a sure sign that the piston is letting hot gas past it, and the piston rings should be looked after.

Sometimes a clogged muffler causes an engine to miss fire from back pressure. To test for this, cut out the muffler and see if the engine still misses.

TROUBLE DEPARTMENT.

Under this head are questions and when possible, replies to them. Our readers will appreciate the importance to inquirers of furnishing the desired information promptly.

This department is intended to be a "trouble clearing house," and it will be esteemed a favor if our readers will add information to it from their own experience or knowledge.

Rear Explosions.

From C. D. Steiner, Ohio.—I have a one-cylinder, two cycle engine that frequently explodes in the crank case, or, in other words, has "rear end explosions." It does this especially when the firing is late. I have told a repairer that it was due to a leak in the cylinder, which he does not believe is the trouble.

Reply.—The cause of rear end explosions in the engine are either due to late ignition or a too slow burning mixture. We should say that you are wrong in your theory, that they may be due to a leak in the cylinder.

A Heating Engine.

From A. H. Cobb, Iowa.—I have a Ford runabout and of late it has been bothering me on account of heating; have thought in the last day or two that I was using too cheap grade of lubricating oil. Please give me your opinion through your journal.

Reply.—The cause of the overheating of your engine may possibly be due to the use of a cheap lubricating oil, and it may likewise be due to your supplying the motor with a large quantity of gas in order to get the required power. It may be said that cheap lubricating oil is about the most expensive and dangerous thing that can be used in an automobile.

For Cleaning and Polishing the Car.

From William Davies, Ohio.—Do you know of anything that will clean the finished wood and metal works of my car and not injure them? I want something that will not leave them sticky and cause them to collect more dust than before they were touched.

Reply.—The best thing we know of is the Liquid Cleanser, made by the Brooks-Gordon Manufacturing Company, 24 East 21st St., New York. This polishes as well as cleans, and is as good for metals as for woods. It is especially good for enamelled and coated leathers.

Carburetter Troubles Remedied.

From William Kuhlmann, Texas.—Some time ago I had trouble with my carburetter. The gasoline supply became erratic and irregular. Upon examination I found the needle had worn and projected too far through the opening, causing it to stick. Upon dressing the pointed part with a smooth file and regrinding into the opening, my troubles came to an end. I am using an old style Holly carburetter, and it was flooding badly. I found that the weight which is held by a thread on the needle stem became displaced. By simply screwing it back into its place the trouble ceased.

Out of Mesh.

From Phillip Cole, Kansas.—I find that the gears of my car are apt to get out of adjustment with the gear lever, so that although the lever is in the right notch, the gear wheels are not truly meshed. Is there any remedy except constant adjustment?

Reply.—You do not mention the kind of car you are using, but possibly your quadrant is not secure to the chassis, and that when putting your gears in, say forward, it rocks over, and thereby gives too long a travel to your gear lever, and when coming back you may also pull the quadrant back by coming up hard against the stop. Possibly, also, your change speed lever may be loose on its shaft. The remedy is to screw the quadrant bolts tight up, making it rigid with the chassis.

Starting the Motor.

From J. A. Roome, New Jersey.—I would like to ask how I can start my motor without priming it. I have an Olds runabout with Holly carburetor. The spark is very strong.

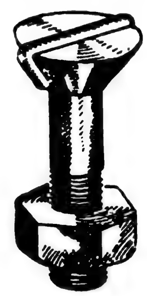
Reply.—There is absolutely no way by which you can start your motor without having it primed, and this is the case no matter how strong the spark may be.

Screwing on Cylinder Heads.

From Edward C. Kern, Montclair, New Jersey.—Why don't makers screw the top of cylinders on so you can clean the cylinders easily?

To Prevent a Bolt Turning.

From C. E. H., New York—In going over the various points of the car that were showing signs of incipient rattling, believing thoroughly in the application of the following proverb to the question of rattling, viz., "A stitch in time saves nine," I found that the lamp bracket on the dashboard was working loose. On proceeding to tighten it I found the whole bolt revolved, and, unfortunately, the head, which was countersunk into the wooden dashboard,



was covered by the wind screen attachments. There was no help for it but to remove these, but when I had done this I discovered that there was no slit in the head for a screwdriver. This was soon supplied by means of a file, and, though the slit would serve for the immediate want, I thought it advisable to make provision for the future, but, having no drill handy, I was unable to insert a pin. I therefore continued the slit through the corners and hammered a piece of copper wire into the slit and down the sides. This copper bedded itself into the wood, and proved an effective preventive to turning.

Meshing the Gears.

If in repairing an engine, the timing gears are removed, they may be replaced correctly by looking along the side of each gear for a center punch mark. These marks are put on the gears at the factory and the gears should be meshed so that the two marks will be as close together as possible.

For Missfires.

In looking for trouble in a strange engine that missfires or won't run, always test out the spark and batteries first and the carburetter and air mixer next, and don't take anybody's say-so that they are all right.

Interesting and Instructive.

From Harder's Gun Works, Pennsylvania.—You have a very interesting and instructive paper.

ROTARY ENGINES.

Various Types, Including the Turbine and the Revolving Engines.

In the July issue details were given of a new revolving engine which has called out many inquiries from our readers. It may be stated that we are not prepared to add to or withdraw anything from what was therein stated. The matter is interesting, and we hope the engine will accomplish all that is hoped for it. Although, as described, it is not intended especially for automobiles, but rather for aeroplane work, yet there is no reason why the principle should not be applied to run a car. Of course the general public learned long ago not to put too much faith in new inventions until they have been put to a practical test.

The revolving cylinder engine, says the *Auto Car,* must not be confused with the rotary engine. For the former there appears to be some future. Considerable attention is being paid to the details of its design. The principle of the thing is simple, and it appears to be especially good for motor bicycle gasoline engines. A somewhat crude, though quite practical, revolving cylinder engine was recently brought out in England. While the workmanship of the engine is not good, there are points in the design which are good. There are two cylinders and the crank remained fixed, so that the gas exploded in the engine cylinders caused them to rotate. The air-cooling effect on the cylinder is admirable. A result of the rotary cylinders is that there is a flywheel action due to them, hence the extra weight of a flywheel is saved. The vibration of the engine seems less, although this may be difficult to prove.

The rotary engine occupies a position unique in the history of invention. For over fifty years it has received the attention of inventors, and no efficient engine has yet been devised. It is remarkable that a type of apparatus which has met with so little success should continue to be the object of such care and thought. It may be that the inventor is ignorant of the work that has been done before on similar lines, and fancies his type of engine is entirely novel in design; or, perhaps, he knows something of his subject, and is attracted by the almost numberless forms which his engine may take. The idea of the rotary engine is to arrange the piston or part acted on by power, so that a motion of rotation is communicated directly to the shaft, without the interposition of the familiar crank and connecting rod. The ordinary steam engine mechanism is admittedly a source of considerable loss of power, but not so great as some inventors seem to think. The loss is a friction loss, which generally has its counterpart in the rotary engine; the obliquity of the connecting rod produces a variation of torque in the crankshaft, but the variation is compensated, when necessary, by a flywheel. The obliquity is not the principal cause of any loss peculiar to the reciprocating engine; vibration and alternating stresses are the chief objections.

The steam turbine, though certainly a "rotary" engine, is not usually classed among the machines known as rotary engines. With these latter there is always a part —an abutment—corresponding to the cylinder head of an ordinary engine, and against which the steam or petrol gas expands. The piston usually consists of a vane or block of variable shape projecting radially from the periphery of a drum mounted on the engine shaft. The whole is enclosed in a casing, there being an annular space between the casing and the drum. This space corresponds with the cylinder of the ordinary engine. On pressure being admitted, the piston block or vane is forced away from the abutment, and travels round in the annular space, thereby giving a motion of rotation to the shaft. It is clear that the power can force the piston round for a complete revolution, after which the piston will be again adjacent to the abutment, only now it will be behind it instead of in front of it. The piston must, therefore, be got past the abutment in order that the rotation may be continued, and this operation the inventor accomplishes in an astonishing variety of ways.

In one type of engine the abutment is caused to slide radially outwards out of the way at the right instant by a cam or other mechanism worked from the engine shaft. As soon as the piston block has passed, the abutment is brought back into place again, steam is admitted as before, and the motion is continued. Sometimes the apparatus is simplified by dispensing with the cam gear, and forming either the abutment or the piston block with inclined faces, so that the abutment is automatically pushed out of the way by the piston as it approaches.

In another type of rotary engine the abutment is made to rotate. It takes the form of an equal armed cross or star, mounted in such a way that the arms project successively into the annular cylinder. The piston block strikes the arm which for the time being is acting as the cylinder head, and causes the abutment to rotate about its spindle. The arm in front of the piston moves out of the way, and the next arm comes down behind the piston to act in the function as a cylinder head for the next stroke, and so on. A great number of modifications have been suggested, especially in the shape of the abutment and in the manner of its rotation. Sometimes it is rotated by cams on the shaft, and very frequently it is made to act as cut-off valve in addition. The inventor, indeed, is very fond of making his abutments, perform the office of valves, and it is perhaps as well, for generally the apparatus possesses plenty of features liable to get out of order without adding complicated admission gear. There is still another complicated form of engine possessing a movable abutment. This time the abutment is actually hinged at one end to the outer casing, while the other end bears upon the internal drum from which the piston block projects. As the block comes round it pushes the hinged part more or less gently out of the way.

In all the types considered up to the present the abutment is withdrawn at the proper instant from the approximately circular cylinder, but in another very wide class the abutment is fixed, and the piston block itself is caused to get out of the way at the right instant. Evidently the piston block cannot in such cases be a fixture on the internal drum. The most obvious way of effecting its disappearance, when required, is to arrange for it to slide into the drum just as in the other case the abutment slid outwards. The piston vane is forced inwards by the inclined faces of the abutments or by suitable cam gear, and springs are generally set in the slot in the drum to force the vane outwards during the ordinary part of the revolution.

These are the main types of rotary engines, though many peculiar constructions which do not come under these heads have been proposed from time to time. The so-called spherical engine, for instance, is perhaps one of the most ingenious pieces of mechanism ever devised for the development of power. Description is practically impossible without reference to models or drawings. It will suffice to say that the steam "cylinders" usually take the shape of segments of oranges, and that a disc wobbles about in them in a wonderful manner. The motion of the disc in some forms of the engine is exactly reproduced in the motion of the middle part or cross of the coupling.

The idea of a rotary engine is attractive at first sight, and one can understand the enthusiasm of the inventor

whose engine, according to his expectations faithfully reported by non-technical writers, is to revolutionize industry in some or all of its branches. But it needs only a moment's consideration of the mechanical difficulties in the way to realize why these engines have so far been commercial failures, and why they are for ever likely to remain so. The wear and tear at the abutments and piston parts are enormous, and is increased by any mechanical constraint designed to remove the uncertainty of action of these parts. Rotated at low speeds, each piece of mechanism will very probably give satisfaction as a pump or a blower, but in a prime mover we must have a fair speed, and little wear and tear as well as a low steam consumption. The steam trials of rotary engines are seldom reported; the reason is not far to seek. Moreover, wear is extremely difficult to take up, and the efficiency falls off at a great rate. In spite of all this, the flood of invention in this direction increases year by year. The present tendency is to simplify the parts and modify the engines for working with gasoline, etc., but with the steam turbine giving such satisfaction and the gas turbine looming ahead it seems a waste of ability to seek to introduce rotary engines.

Valve Leakages.

Valve leakage can be easily located by immersing the valve in water when the tire is inflated. In case the spring plug is not absolutely airtight no great harm will be done, provided the cap holds the air after it has been screwed down. See that no dust gets in the seat to prevent the cap from closing up tight. Clean the plug; if it is worn out change it for another, which you should have in stock. If the cap leaks, examine the rubber washer inside the head of the metal cap; if it is worn, replace it with another. If you have nothing better, a washer of leather, soft wood or cloth smeared with tallow will answer.

The nut at the base of the valve should never be unscrewed, and it should always be screwed up tightly. Many inner tubes cease to be airtight solely because the nut has been interfered with.

Keep oil away from the valve. All greasy substances have an injurious effect upon rubber; the little plug would soon swell, adhere to the inside and it would no longer be possible to move it. Good valves work perfectly when directions are followed.

Engaging Threads.

When a lengthy tube, such as a gasoline pipe or oil feed, is disconnected, some difficulty is often experienced in re-engaging the threads of the nut and its union, owing to a "set" in the pipe forcing them to come together slightly on the skew. The use of force is fatal in such circumstances, as the nut is a light one, and its union is generally of soft brass, while if force be often employed the soldered joint between cone and pipe is likely to commence leaking. A very simple expedient, which permits such obstinate unions to be safely and instantaneously engaged, is to file or grind off the first thread on both nut and union, after which they will center themselves automatically; but care will still have to be exercised not to strip or cross the thread.

Cause Broken Springs.

Loose spring clips are the cause of many broken springs, for they allow more stress to be thrown on the center of the leaves than there should be. If the clips are perfectly tight the portion of the spring between them is practically a solid piece, but if one of the clips is loose there is much more individual movement among the leaves.

Hard and Soft Tires.

Some useful experiments have been carried out on a Napier car at Brooklands track, in England. They deal with the effect upon the speed caused by various air pressures in pneumatic tires, and some rather surprising results at first sight are obtained. Motorists have generally believed that a well pumped tire was faster than a slack one on the same car, yet this theory does not tally with the results given on the occasion referred to. But allowance must be made for the difference in the conditions between cars when racing on a track and used in the ordinary manner on the rods. It is certainly a matter of experience that a touring car runs better when the tires are hard. But when the pace ranges from sixty miles an hour upward other phenomena make their appearance which exert a decided influence upon the car's behavior. When a car is driven at racing speed the effect of the inequalities of the track or road are immensely intensified and exaggerated in fact to a degree incredible unless one has had personal experience, causing the car to bounce violently. In fact the mechanics on racing cars find it necessary to hold on by straps to prevent being shot out. While the driving wheels are off the ground they revolve idly and power is lost, because the speed of the car is diminished by the resistance of the air. For this reason the good effect of well pumped up tires is modified, so that no better results were obtained when using 100 pound pressure than 35 pounds at Brooklands. This is, of course, of little value as far as the touring car is concerned, as the conditions are very different, but it is interesting as showing the advantage of smooth roads. For ordinary use the tires should be kept hard, as they will wear much better than when partially inflated, while there will not be any loss of power at ordinary road speeds.

Running at Low Speed.

For an engine to be able to run quietly and uniformly at low speeds is a good feature, and one which generally denotes that the engine is in good trim. Many engines, although tuned up to perfection, will not run well at low speeds without spluttering or misfiring. This has been cured in one or two cases by fitting springs to take up the slack in the engine control mechanism. If the contact breaker be examined it will be found that it can generally shake through quite an appreciable degree in the direction of advancement or retardation, and the same generally applies to the throttle valve and air control. It will be obvious that if these parts are moving under vibration the engine cannot run uniformly. By fitting a light spring to keep each control device in one direction which will not affect its movement by hand any accidental movement and erratic action will be prevented.

As the big hub caps, which many motorists think are intended only for advertising purposes, frequently are reservoirs to contain grease as a part of the wheel lubrication system, they should be removed and cleaned at least once a month.

Shackle pins and axle clips are subject to constant strain. They are liable to come loose at any time. Keep a watch of them.

A Good Driver.

A competent driver starts and stops his car with few shocks and little friction. In changing gears let them be sharply meshed so as to avoid grinding the gear teeth at their edges. In starting a car equipped with planetary gears, the lever should be in a neutral position (preferably between low and reverse), and when the motor is moderately speeded the lever should be gradually thrown forward to the low speed notch. Then, when the car has attained a fair speed, the lever may be shifted to the high speed point, all of which may be done smoothly and without shock.

Anti-skidding Tires.

According to French statistics a smooth surface tire should run between 5,000 and 6,000 kilometers, 3,106 and 3,728 miles, while the anti-skidding tires are hardly good for more than 4,000 kilometers, 2,485 miles, on French roads. Eventually the nail wears through the canvas linings and then repairs are difficult. The use of chains woven about smooth tires, such as is seen in New York, would not be permitted in France under any circumstances. As it is the nailed tires are doing incalculable damage to the roads.

Keep the Lamp Clean.

Keep the acetylene lamp clean. The burner has a small aperture and is liable to become obstructed. It may be cleaned by the fine, hard brass wires sold for hypodermic syringes, while the larger bore often terminating the jet should be cleaned out by a drill that fits it. Air apertures in the burner, if present—for some of the best jets act on the principle of a miniature pair of Bunsens—equally require to be kept free from obstruction. Clogging of the burner occurs to a variable extent with different lamps, several causes contributing to it.

Water for Cooling.

Rain water is best for the cooling system. There is always more or less evaporation going on, and if the engine happens to run hot the water boils more or less actively. If it be of a mineral nature there will be a considerable deposit in the radiator and the other metal parts of the system at the end of a season's running.

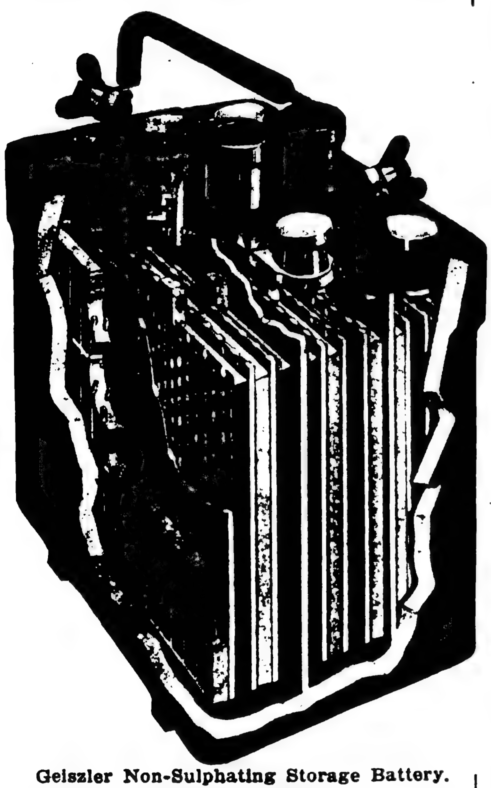
Best He Has Ever Seen.

From Smith Trump, Danville, Iowa.—The paper is the best treatise on automobile work that I have ever seen.

GEISZLER STORAGE BATTERY.

An Effective, Non-Sulphating Battery for Automobile Use.

One of the most difficult problems in the construction of a storage battery is the destructive feature of sulphation of



Geiszler Non-Sulphating Storage Battery. Sectional View.

the active material. Sulphation decreases the capacity of the material on which the storage battery depends for its energy. It is no uncommon occurrence when recharging storage batteries to discover that sulphation has resulted in a depreciation in the rated capacity of the battery of from 30 to 80 per cent.

If the remedy for preventing the dreaded sulphation lay alone in the selection of material of the highest quality, the way of the average storage battery manufacturer, in attempting to produce a dependable product, would be made clear. The remedy for this evil, however, does not alone lie in a careful selection of materials but in the knowledge of how best to chemically combine the available high-grade materials for the purpose of eliminating the evil of sulphation.

In addition to using materials of the best quality obtainable, the manufacturers of the Geiszler Storage Battery guarantee that their product will positively not sulphate, and that, furthermore, the chemical treatment of the "Active Material" precludes any possibility of its becoming dislodged. These features which prolong the life of the battery and insure the highest possible efficiency, are distinct and exclusive features of the Geiszler Battery.

The extreme dependability of the Geiszler Storage Batteries for use in connection with ignition systems, render them invaluable for such purposes as motor car or boat, and gas and gasolene engine ignition.

In order that it may be thoroughly understood that the Geiszler Storage Battery, in addition to its exclusive feature of nonsulphation, typifies all that is modern and up-to-date in its construction, attention is directed to the sectional view shown herewith. The acid and water-tight construction of the Geiszler Storage Battery enable its manufacturers to use the electrolyte in its liquid state. This is accomplished without the ordinary attendant danger from escaping acid. A detailed description of the construction of the Geiszler Storage Battery is as follows:

The carrying case is made of extra thick, hard rubber, and is provided with soft ruber "bumpers" which serve to prevent fracture from the rough usage so often inevitable..

The separate cells are made by dividing the interior of the carrying case into compartments. The division walls of the cells form an integral part of the carrying case.

The plates are specially constructed to stand the strain to which they are subjected in this kind of service, and are also designed to withstand the mishandling which ignition batteries are liable to receive at the hands of inexperienced and careless people who may be called upon to use them.

The active material entering into the plates and the chemical treatment to which it is subjected effectively prevents its displacement. This insures a full rated capacity at all times and prevents short-circuiting of the plates. The loosening of the "Active Material" and its precipitation to the bottom of the cells is responsible for short-circuiting in all other lead batteries.

Thorough insulation between all plates, is provided by using separators of perforated hard rubber and ribbed wood, which also precludes any possibility of short-circuiting by direct contact.

The sealing of the separate compartments by an inner hard rubber cover and a thick layer of sealing compound, over all compartments, insures both acid and water-tight construction.

The vents are so constructed as to allow the free escape of the gases and, by virtue of the indirect openings, to effectively prevent both evaporation and spilling of the acid.

Corrosion has been eliminated by heavily silver plating the screws in the terminal binding posts. The nuts and cell connectors are made of a special composition of antimonious lead which is unaffected by acid and sufficiently hard to properly perform its functions.

The handles are made of German silver wire and, for ease in handling, are covered with rubber tubing. They are sprung into place in cavities drilled into the sides of the carrying case and may be readily removed if occasion requires.

We can cordially recommend the Geiszler Storage Battery as a thoroughly practical and reliable adjunct for any motor car. Write for further particulars, free catalogue, prices, etc., to Geiszler Bros., 518 West Fifty-seventh street, New York City, and mention the AUTOMOBILE DEALER AND REPAIRER.

WANT ADVERTISEMENTS.

Under this head will be printed advertisements of shops for sale or to rent, or shops wanted, or situations or help wanted, or tools or machines (second-hand) wanted or to exchange, at the uniform price of two cents a word, which will include the address, for each insertion, payable in advance. No advertisement will be inserted for less than 30 cents, however small.

Remittances can be made in postage stamps if more convenient. Address,

MOTOR VEHICLE PUBLISHING CO.,
24 MURRAY STREET, NEW YORK.

KELLER'S BOOK—"Construction, Management and Care of Motor Cycles." Full of valuable information for riders or beginners, and gives pointers to prospective buyers that will save them many $$$$$$$ in selecting a motor cycle. Sent postpaid on receipt of 25c., stamps or silver. Advance Sales Co., St. Paul, Minn.

FOR SALE—Model E Franklin Runabout, in perfect condition, and complete equipment and extras; $500.00. A. G. Braastad, Ishpeming, Mich.

$7.50—SIX-VOLT, 60-ampere Sparking Battery. I have 200 of them. They are a well known make and perfectly new goods. A rare chance to buy a $25 battery cheap. S. Breakstone, 900 Fisher Bldg, Chicago, Ill.

WANTED—White Steamer Runabout, or will exchange good Knox Runabout for steamer. William Brown, 235 North Eighth street, Paterson, N. J.

FOUR-CYLINDER 35 H. P. CADILLAC, just overhauled; cost me $2,800. Extras. Jones Speedometer, Prest-O-Lite, Conn. coil. Highest offer under one-half above price takes the car. Eugene Buckman, 68 Lake Place, New Haven, Conn.

FOR SALE—New two-cylinder, air-cooled motor, V type. 3¼ inch bore, 4 inch stroke, 8 h. p. Has clutch and complete outfit. Price $115.00. H. E. Burlingame, Providence, R. I.

WANTED—1907 Auto, good condition, in exchange for 40 acres California mining property near railroad. Valued $5,000. Box 627, Nazareth, Pa.

FOR SALE—We still have a number of four-cylinder water-cooled 4-cycle automobile engines for sale, new in original crates; 20-28 h. p. Price $225. Evansville Automobile Co., Evansville, Ind.

BARGAIN—Must sell quick 2-cylinder runabout; $250 if taken quick. Condition guaranteed. Get description. Lock Box 7, Cayuga, Ind.

MECHANICAL DRAFTING—Experienced draftsman will make neat and accurate drawings at reasonable prices. Automobile work a specialty. H. E. Burlingame, Box 89, Providence, R. I.

FOR SALE OR TRADE—1904 Packard without engine, with upholstering, body and running gear; good. You can get this for less than the tires cost. C. E. Kimball, Council Bluffs, Ia.

FOR TRADE—Two-cylinder touring car for lathe, shaper and machine shop tools. Archa Hoffman, Lafayette, Ind.

HOWARD AUTO BUGGY, slightly used; price $350. Six-horse marine 2-cycle engine; new. Howard Bros. Co., Edgerton, O.

WANTED—To trade a 5-passenger touring car for a 1907 or 1908 Ford runabout; good condition; write at once. Address Lock Box 129, Marathon, Wis.

POPE-HARTFORD Model B, improved, at $350. Lock Box 323, Barre, Vt.

FOR SALE—Two Ajax tires, 30x3, just retreaded, and one some worn. W. A. Linn, 67 Clinton Place, Hackensack, N. J.

FOR SALE—Pierce Arrow 1907, 40-45 h. p.; cost $6,200, equipped; sell for $2,700.00. A. Moll, 614 Franklin ave., St. Louis, Mo.

CHAUFFEUR—Young man, white, honest, sober and industrious; careful driver; make all repairs; have own tools. Pennsylvania license; best references. Hayes Pettit, Port Royal, Pa.

TYPE VIII. AUTOCAR, good running order; car in Brooklyn; $300. Want light runabout. John W. Rusk, Haines Falls, N. Y.

$60.00 buys small shaft drive runabout without motor. Has wheel steer and slide gear transmission. H. E. Burlingame, Box 89, Providence, R. I.

FOR SALE—2 1908 Indian Motorcycles, 2¾x3¼ H. P., at $165 and $185 or less; ran 100 miles. Make us an offer. Renner Repair Co., New Midway, Md.

"HOW TO CURE CARBURETER TROUBLES"—valuable advice from one who knows. Send six cents postage for free 36-page text-book. "Carbureters and Engine Troubles." Breeze Carbureters, Newark, New Jersey.

17 CARS MUST GO REGARDLESS OF cost. Runabouts to 4-cylinder 30 h. p. $3,000 cars $100 to $850. Write for bargain sheet and save money. T. S. Culp Exchange, Canton, Ohio.

FOR SALE—Steam Automobiles; write for illustrated bargain list. F. W. Ofeldt & Sons, Nyack, N. Y.

BROKEN CASTINGS WELDED. Any wheel. Guaranteed like new. "Futterman Welding System," New York Coach & Auto Lamp Co., 798 10th avenue, New York city.

CHAUFFEURS, machinists and repairmen can secure free a set of Bullard wrenches. Write us for special offer. Bullard Automatic Wrench Co., Providence, R. I.

FORD RUNABOUT OWNERS—Modernize your car with Rumble seat and trunk, $15. Glass front, $12; 3-hinged folding hood, $8; roadster fenders with brass bound running board, $12. Discount to dealers. State your wants for catalogue. Auto Rebuilding Co., Chicago, Ill.

REBUILD YOUR CAR into "Gentleman's Roadster." We make latest style hoods, radiators, tanks, fenders, "hood dashes," glass fronts, auto trunks, Rumble seats, etc.; 20% saved. Your old car re-designed free. Hood and Dash outfits for '03 and '04 Ford, Cadillac and Winton in stock. Smashed lamps and radiators repaired like new. State your needs for catalogue. Auto Rebuilding Co., Chicago, Ill.

CHEAP—Two Hartford Dunlop 32x3½ tires, seconds, for 1905 rim; complete with inner tubes; write for prices. Bradley H. Barnes, Southington, Conn.

WANTED FOR CASH—Remnants of Trimming Cloth, Leathers, Carpets. R. B. Corbett, 862 Summer ave., Newark, N. J.

SOLICITORS WANTED.

WE WANT MEN in all parts of the country to solicit subscriptions for the AUTOMOBILE DEALER AND REPAIRER, and are prepared to offer extremely liberal terms. For particulars address the Motor Vehicle Publishing Co., 24 Murray street, New York.

CORBIN (air cooled); good condition; tires nearly new; price $600. Top E. Van Scoy, Bradford, Pa.

SLIP NIT FOR AUTO CLUTCHES AND Motor Cycle Belts—Absolutely guaranteed to stop auto clutches and motor cycle belts from slipping. Price $1 per package. Wilson Garage, Berlin, Wis.

POSITION WANTED—Young man, expert repairer, would accept chauffeur position. Address Matthews, care of Automobile Dealer and Repairer, 24 Murray st., New York.

New Tire Agency.—The Empire Automobile Tire Company, of Trenton, N. J., has established a new agency in Cleveland. Mr. E. T. Horsey will handle these tires at 1268 Euclid avenue, and the greater part of the state of Ohio will be handled through this agency. Mr. Horsey will operate under the name of the Empire Tire Agency.

New Automobile Factory.—The Gramm-Logan Motor Car Company, a newly organized concern, will manufacture automobiles on a large scale at Bowling Green, Ohio. This town, situated just a little south of Toledo, has splendid shipping facilities, having the same freight rates as Toledo. Those identified with this company are men with ample experience in the automobile business. B. A. Gramm, the vice-president and general manager, is one of the pioneers in the commercial car industry. Fred Bisantz will be superintendent of the factory, and the president of the company is J. B. Wilson, a man of great practical business experience. A large modern plant has been constructed, the buildings being of brick and on the modern one-story plan. The works are so designed and arranged as to be ideal for the commercial truck industry. The Logan truck, which has proved itself to be an excellent vehicle, will be further improved. They will have a good line of cars and a selling proposition which will make the dealers "sit up and take notice." Further information will appear in later issues of the Automobile Dealer and Repairer.

Entering a New Field.—The Turner Brass Works, of Sycamore, Ill., who have been well known as manufacturers of automobile specialties, including the Harroun Auto Bumper and a very popular carbureter, have recently added a motor boat and accessory line, which is claimed to be second to none. We are in receipt of their catalogue No. 281, which has just been issued, showing their complete line of motor boat and automobile accessories. This catalogue may be had for the asking, and every buyer should have one.

The "Eclair" Instantaneous Pump Connection.—This is manufactured by the Lovell-McConnell Manufacturing Company, of Newark, N. J. It is fully described in their attractive announcement on our outside back cover, and to this announcement our readers are referred for interesting details.

Woodworth Tread.—The Woodworth Tread, it is stated by the manufacturers, the Leather Tire Goods Company, Newton Upper Falls, Mass., will not stretch or crack in any kind of weather or hard usage. It positively will not chafe or heat the tire. With the Woodworth Tread your car will not skid on muddy and slippery roads, and the tires cannot be punctured when they encounter sharp stones or glass, or any other uneven surface on country roads. But write for their catalogue, mentioning the Automobile Dealer and Repairer, and you can learn all about them.

Shape of the Needle Valve.

Faulty carburetter action may frequently be remedied by altering the shape of the needle valve, whether it be employed in regulating the flow through the jet or simply into the float chamber. If the taper be lengthened the result will be a less rapid opening or closure in proportion to the same motion of the spindle. If it be decreased the action will be accelerated. Before making any alterations in the shape of the needle, however, it should be ascertained beyond a doubt that the change will be beneficial, and in making the change care should be taken to leave the needle perfectly circular in cross-section, or, in other words, truly conical in shape. When the shape of the valve has been altered to suit the requirements its seat should be ground to proper conformity by the use of fine emery and oil in the usual way.

Dragging Brake Bands.

Experienced drivers frequently advise beginners regarding the inadvisability of allowing the brake bands to drag when the lever or pedal is in the off position. In order to ascertain whether they have ample clearance it is necessary in many instances to crawl under a car and in others to jack up the wheels and turn them over by hand, judging by the "feel" whether any undue resistance exists. A far simpler way, and one which appeals readily enough to the experienced driver, is merely to bring the machine to a standstill without recourse to the brakes and after it has been running for some little time. If the brake bands are found to be hot, or even warm, the symptom may be considered as conclusive evidence of an adjustment that requires some remedying.

Permanit, a New Tire Remedy.—If it were not for tire troubles the life of the motor car owner would be comparatively happy. Effectual remedies for tire troubles are always warmly welcomed by the trade. Adolf Karl & Co., 239 Washington street, Newark, N. J., are acting as agents for a new tire remedy called Permanit. This preparation is imported from Europe, and is now introduced for the first time in the United States; but in Europe it is exceedingly well known. Over six million cartons of the remedy have been sold abroad in one year. This remedy will heal punctured tires, it is stated, without injuring the rubber; neither does it increase the weight of the tire. Permanit does not dissolve in water, neither does it become a paste, glue or fluid. The preparation comes in powder form, rendering it very convenient for use. Eight ounces of the powder are sufficient for a tire, and it is claimed that it absolutely prevents the danger of punctures. Dealers throughout the country are urged to write to Adolf Karl & Co. for prices and particulars of the plan by which Permanit is to be placed on the market in the United States. Interesting literature and complete particulars will be forwarded if you mention the Automobile Dealer and Repairer.

A New Speedometer Agency.—The Stewart & Clark Manufacturing Company of Chicago has arranged to open a branch office in New York City, at 1878 Broadway, for the sale of their Stewart and American Speedometers. This will be a great convenience to Eastern car owners. The great success of the Stewart Speedometer is largely due to the fact that the manufacturers own and operate the largest flexible shaft factory in the world, having been specialists in flexible shafts for thirty years. The new Stewart Speedometer, which will be extensively advertised, has a swivel joint, which is as novel as it is effective.

Scientific Lubrication Lowers Auto Expense.—There always comes a time in the experience of every motor enthusiast when he learns that the question of engine lubrication is not a subject to be lightly guessed at. There is a surprising difference in the oil requirements of different cars. The oil adapted to a steamdriven car might ruin an air-cooled gasoline cylinder within a mile, and the only safeguard is the use of an oil exactly adapted to the car. By a series of exhaustive tests, the Vacuum Oil Company, of Rochester, N. Y., has made it possible for any automobile owner to secure the one special oil exactly adapted to his particular car, without the risk and expense of private experiment. They have produced a specially high-grade oil, called Mobiloil. There are five different grades of Mobiloil, alike in quality, but each adapted to a particular work. Some one of these five grades is the ideally perfect lubricant for any particular car. To be certain of getting the right oil for the right car, any automobile owner can get a valuable booklet free on application to the Vacuum Oil Company, Rochester, N. Y. This booklet lists every car made, and indicates the special grade of Mobiloil exactly adapted to it. It is really an authoritative textbook on auto lubrication, and contains much general information of vital interest to the fraternity. Mobiloil can be had in sealed cans with patent pouring spout of almost any dealer. It is also put up in barrels for the garage trade.

The Heitger Model C 1909 Carbureter.—This new carbureter has mechanical control of gasoline feed. Its construction is simple and reliable, without delicate levers or cams to adjust. The manufacturers state that this carbureter gives maximum power, fine control, low gasoline consumption, and it is easily started. Special types are made for Buick and Ford runabouts. This carbureter is put on the market with a strong guarantee. Readers are requested to write for descriptive circular and prices to the Heitger Carbureter Company, 212 West South street, Indianapolis, Ind. In writing them please mention the Automobile Dealer and Repairer.

A Low-Priced Speedometer.—As there is considerable demand on the market for medium-priced speedometers the Peerless Specialty Company, 1876 Broadway, New York City, have offered to the public their "Peerless" Speedometers which sell at $30 complete. Although the price is so low, the manufacturers claim that this instrument is equal to any of those sold at $75. For further technical description and other particulars write to the manufacturers.

Classified Buyers' Guide.

Index to Advertisers.

Automobile Dealer and Repairer

A PRACTICAL JOURNAL EXCLUSIVELY FOR THESE INTERESTS.

VOL. VI., NO. 2. NEW YORK, OCTOBER, 1908. PRICE { 10c. PER COPY / $1.00 PER YEAR

A Practical Automobile School.

In many cases it is found profitable and desirable to run an automobile school, or in any event to take a few pupils, in connection with a garage and repair shop. There are several such garages in New York City, and they seem to be preferred to the school where the instruction is more theoretical and where there is less chance for driving and repair work.

In Schenectady, N. Y., C. S. Mack has the only fireproof garage in the city, and with it he combines a most successful school with a large number of students. Instruction is given in the care, repair and driving of cars, and as the school never closes, many study during their spare hours, and they may stay as long as they wish for the one price of tuition. The garage is lighted by electricity, and has a roomy pit extending along one side for 50 feet where students may work beneath the machines. Among the different cars that may be worked upon is one with eight speeds to it, four forward and four reverse, making it one of the most complicated in some respects that can be found. The tuition fee for the complete course is $50. The time required to complete it depends altogether on the student's concentrative powers, his plan of studying, and the time he gives. Some, studying two hours a day for six days a week, finish the course in less than three months. The average student requires a little more time; several graduates, however, have completed their courses in two months. No student is graduated until he has thoroughly mastered every detail of the work.

Mr. Mack employs only repair men of long experience and he has the tools and machines for all kinds of repair work. His charges for work by the hour are 50 cents. He carries all kinds of sundries, such as gasoline, oils, batteries and tires. Batteries are recharged by experts for from 50 to 75 cents.

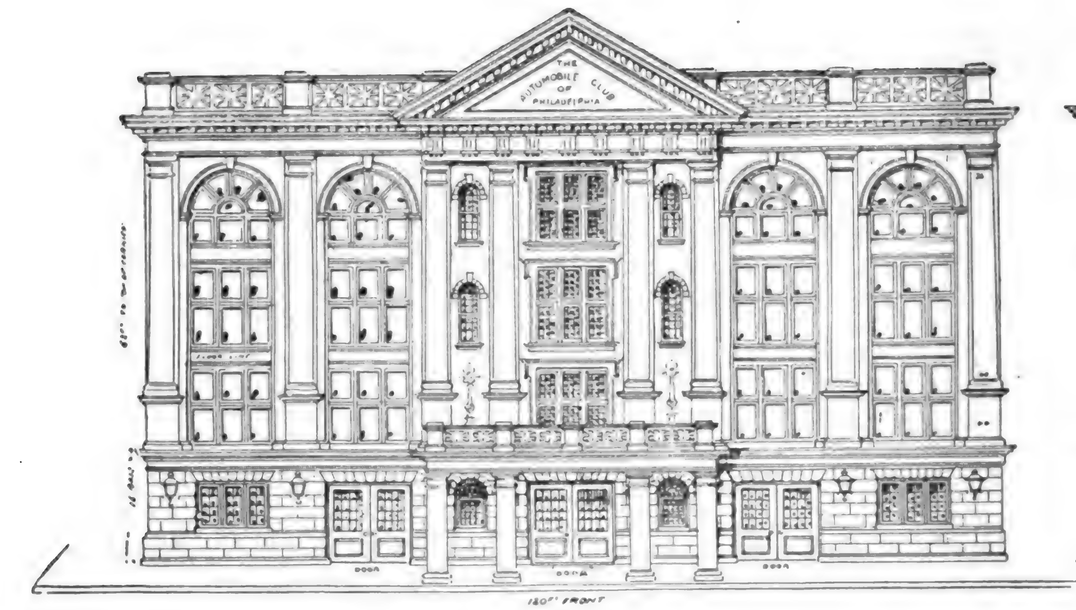
The illustration shows Mr. Mack's pupils at the front of his garage.

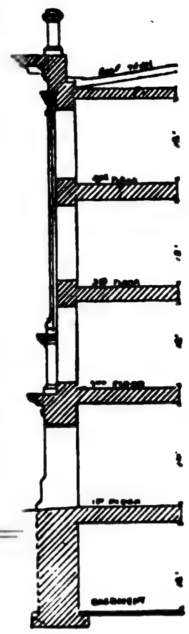
A CLUB GARAGE.

Saving for Car Owners In Cost and In Many Conveniences.

In the medium sized as well as in the larger cities owners of automobiles will find it a matter of economy to club together in the storing and care of their cars. A decided saving can be realized by this method. Few car owners can afford garages suitable for gasoline storage, for expeditious cleaning, and tools and machines for quick repair. But by a combination a single club garage can be erected that will give all these advantages. A large automobile club in Philadelphia is contemplating a step of this kind and one of its officers has outlined a comprehensive plan for a club building, which, *mutatis mutandis*, would answer for a basis for other cities and towns. In the plans and estimates suggested, a building is shown of three floors and one of four floors and basement, on a lot 120x200 feet, which in Philadelphia, and in the center of the city will of course be expensive, and it is estimated will cost $200,000. The three-story building would accommodate approximately 300 cars, viz.: 120 large and 180 medium and small, with ample

locker, cleaning and repair space. This building could be erected in a simple and substantial manner, absolutely fireproof, for approximately $150,000, as ascertained from the preliminary contractor's estimates. The four-



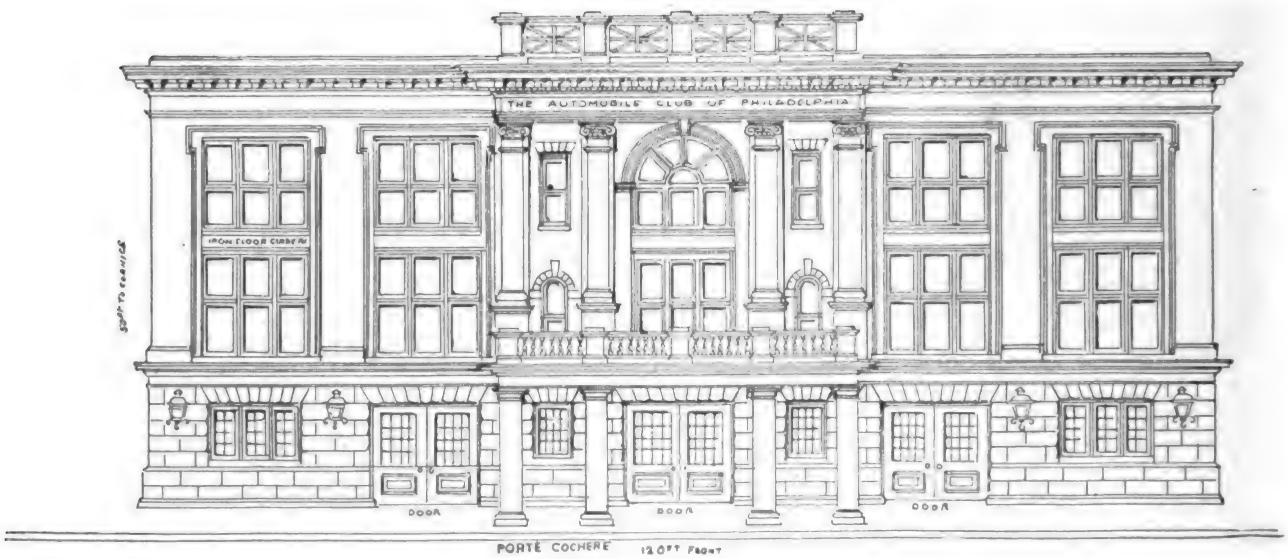


T. Mellon Rodger, Architect.

Front Elevation.

Preliminary sketch showing four-story garage building.

story building would cost about $50,000 more, and care for an additional 100 cars. The interest charges would be, at 5 per cent., $17,500; taxes, $4,500; maintenance,



T. Mellon Rodger, Architect.

Front Elevation.

Preliminary sketch showing three-story garage building.

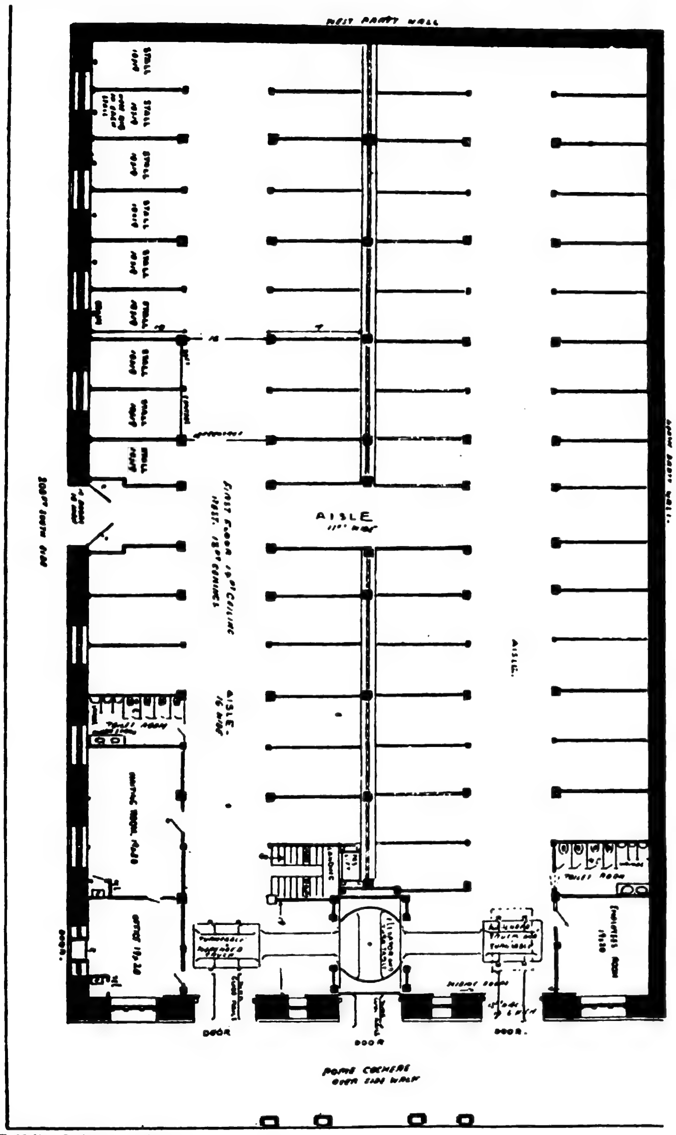
$3,000; insurance, nothing (cars only insured by owners) the total fixed charges amounting to $25,000.

The rental value of modern accommodation of equal size and character now obtainable in that city would be over $50,000 per year. Obviously, therefore, the owners of 300 cars should fare better at a total rental of $25,000 than at $50,000 or more for equal garage space in size, location and merit. The income from such a garage should average in that city $25 per month for large cars and $20 for smaller cars for two-thirds of the year—a total income of say $50,000, outside of any profit on oils, supplies and repairs, etc., assuming only two-thirds use of the capacity of the building. These latter sources should yield the club a good profit and still cost members less than now. After defraying out of this total income the cost of heat, light, water and service, there is every probability that a reasonable net amount profit to the club would result, with better and less expensive accommodation to members than is now obtainable in the city. The financial plan proposed is to raise $150,000 on 5 per cent. income bonds among members, and under this $200,000 on a 5 per cent. first mortgage, thus limiting the absolute fixed charges to $10,000 interest and charges. The proposed building in location and character would be suitable for so many ordinary uses as to always have a good rental value, and hence on its merits a sound investment.

It is likewise claimed that the erection of such a building would enlarge the influence of the organization by insuring wider, more closely associated and unified support, which is of positive benefit; a more agreeable and

dignified garage; no increase in nominal rates; better control over chauffeurs; cheaper and better repairs when necessary; less repairs than now usual, because of better inspection and care of cars; more efficient and careful handling of cars; lower cost of gasoline, oil and supplies.

In some garages cars are carelessly inspected, roughly handled at times, and not always sent out promptly, clean and in perfect condition. Proper inspection lessens immediate care of tires and any trifling derangement about the car before it becomes serious, at slight delay and ex-



T. Mellon Rodger, Architect.

FLOOR PLAN OF CLUB GARAGE BUILDING.

pense, giving longer life to the car, higher efficiency and comfort in operation at decreased cost, and a greatly reduced annual charge for repairs and depreciation.

The club garage, with the mechanical department under the absolute control and management of a master mechanic, the members have the advantage of skilled labor, and the individual expense to the owner is near the actual cost to the club. Repairs are carried out with the object of saving time and money, while in a public garage this end is not usually attained; the sole purpose of the club being the interest of its members, while the ordinary public garage operates from a different standpoint.

Great reduction in tire expense to trifling injuries can be effected by proper attention promptly when first needed. Under a club expert tire inspector the life of the tire is materially increased at a trifling cost. The prompt vulcanizing of any tear or cut in the shoe protects the inner tube from water, sand and dust, and it has been proven by practical experiment and experience that a tire thus cared for will give double service, making a reduction in maintenance of almost one-half in this item alone.

The general cleanliness and perfect mechanical condition of a car cared for under these auspices is certainly a marked improvement over the usual public accommodations now procurable. The nuisance of smoking exhausts can best be eliminated by proper engine and oiling apparatus in the garage, and many other discomforting conditions would find their remedy at that point. The average price per month for the care of a machine in a public garage in a large city is $25, or $300 per year. Allowing 60 per cent. of this for care, the other 40 per cent., or $120, is 5 per cent. of $2,400. So for every car stored for $25 per month the owner is paying approximately 5 per cent. on the investment.

Of course these facts and figures are useful for comparison only. In most instances a club garage would cost far less than is herein outlined, and the cost of maintaining cars would be far less. But that by clubbing together car owners can greatly reduce the cost of keeping and running their cars, besides securing far better service, goes almost without saying. The plan of having a central club garage in the cities and larger towns will finally become general.

THE CHAUFFEUR QUESTION.

Legal Control, Licenses, Speed Laws and Responsibilities.

In a recent discussion of the chauffeur question and the ultimate status of that functionary, Roger B. Whitman, of the New York School of Automobile Engineers, says:

"The automobile has not reached its present position as a necessity without bringing up for solution a vast number of questions, practical, economic and legal, and among the most important are those that bear on the responsibility of the chauffeur and his legal standing. In the early days of the industry the chauffeur was essentially a mechanic, and in the future his position will be that of a servant. At present he is between the two and cannot altogether be blamed if he is unable to find his true position on the scale. This state of mind is due to a somewhat exaggerated idea of personal importance and to his being given more leeway than his position really warrants. It must be admitted that the attitude of the owner is, in many cases, responsible for the lawlessness and inefficiency of his employee. The number of people owning automobiles is vastly greater than the number of horse owners who had coachmen ten years ago, and the new comers have not had the experience in handling coachmen that would guide them in their attitude toward a chauffeur.

"The making of a law must always be behind the condition that demands it, and this is particularly true in the case of that controlling the chauffeur. When this law was first introduced the chauffeur was more or less of an unknown quantity, and the legislators had no standard by which to judge him or to estimate his ability as a trouble maker. The law enacted required a prospective chauffeur to make a statement of his ability to operate certain makes of cars and to pay a tax of $2, no examination being made of his knowledge or ability, of his physical condition or of his character. This law still stands, and the number of incompetent chauffeurs is directly due to this farcical system of adding to the revenues of the state without a resulting return in the protection of the public. The license has no time limit and is not revocable, the penalties for infractions of the law being fines or imprisonment.

"As an example of the working of this law, I may cite the case of the students of the New York School of Automobile Engineers, a trade school for the instruction of chauffeurs with which I am connected, who are required to hold licenses as chauffeurs before they are permitted to take their first lessons in driving. We take all possible precautions against accidents, but this does not alter the fact that a law that makes no distinction between a novice and an expert is fundamentally wrong.

"The self-interest of a chauffeur induces him to be guided by the desire of his employer rather than by the law, but in case of arrest he is responsible and suffers the penalty. The employer's attitude toward the law is not usually one of compliance, and the chauffeur comes to regard the law as something to break whenever chance offers. There is no clause through which he can be reached if he takes the car without permission, and as the owner is usually willing to store his car where the chauffeur suggests, the garages that institute a checking system are avoided in favor of those seeking the good will of the chauffeur rather than of the owner.

"When a car is purchased, the owner registers it at Albany, and pays a fee that entitles him to a number, to be displayed at the back of the car. In case of infraction of the law, the owner may be located through this number, but there is no indication of the identity of the driver, on whom the responsibility really rests. Licenses are only required by those who are paid for driving, and the fact of ownership is taken as evidence of ability to handle the car with safety to the public, but the owner's children or friends, or any one who is not paid for it, may drive the car, and of them the law takes no cognizance.

"It would be unfair in many ways to class the chauffeur with the locomotive driver, of whom the law requires technical knowledge and years of apprenticeship, but it must be admitted that locomotives have no steering control and that the public is educated to keep off the tracks.

"To obtain a license, the driver of an automobile should be required to show his ability to control the car, to drive through traffic on wet asphalt, to make quick stops, and in general to handle it in such a manner that the safety of the other users of the road are not endangered. Having shown this ability, he should receive a number, and it is this number that should be displayed on the car rather than the car registration number, for it gives a direct indication of the one on whom the responsibility rests. If he chooses to permit an unlicensed companion to drive, he cannot shirk the responsibility, and in self-protection will be ready to take the control should occasion arise. The holder of a license should be required to register any changes in address in order that he could be reached should his actions warrant the revoking of his license, and licenses should be required of owners as well as chauffeurs, for the potential danger to the public is as great from one as from the other.

"The law in Connecticut has a clause that serves as a pattern, for the speed permitted is 'according to the discretion of the driver.' In this there is again a direct placing of the responsibility, for to clear himself when charges are brought, the driver must show that the conditions of traffic were such that at the speed at which he was driving there was no danger to life or property.

"The weakness of any law will be due to an inability to take the personal equation into account. One of the recent accidents was due to the sudden advancement of a lad from an $8 a week position as brass polisher to a post that paid him $25, and the sense of his own importance entirely overcame any balance that he may have had.

"In my experience at the school I have been brought into contact with men of every class, but all with a desire to become chauffeurs. Of these, I have been deeply impressed with the coachmen who have been sent to us for training, for they have an attitude toward their employers that leaves nothing to be desired. Their experience has taught them the need of care while driving, their judgment of speeds and distances is excellent, and there is no difficulty in making them competent as chauffeurs."

LUBRICATION.

What to Oil, How to Oil and the Kind to Use.

If all the bearings of an automobile required oiling at the same time, and if all needed the same kind of oil, the question of lubrication would be far more simple. When to oil, how much oil to use and what kind of oil are questions that can only be answered by experience, and no one is better fitted to answer these questions, and no one has more reason to answer them correctly, than the manufacturers of the car itself. We have again and again urged the use of good oil as being by far the cheapest, although it is not always the highest price. One kind of cylinder oil, for instance, may answer for a drive of 600 miles, and another may burn out or wear out in less than 200 miles. The question is about as relative as is the price of a yard of cloth, which may be worth five cents or five dollars, it all depending upon the quality. If the oil is too thick it adds to the friction; if too thin it wears out too quickly. If too cold it works one way, and if too hot another.

Above all, buy your oil of a reputable dealer. There is nothing bought or sold where appearance or examination counts for less. Even if this were not so, so much oil is sold in barrels or half-barrel lots that the dealer's word is practically the only assurance the consumer has that he gets what he pays for.

Many buyers are influenced by the matter of price, without considering quality, or are guided by the advice of a man who is interested in selling the goods on which he makes the greatest profit.

As to substitution and the tests which a satisfactory cylinder oil should stand, tests for the flash point, gravity and viscosity, while interesting to the practical chemist, are unnecessary as far as the motorist himself is concerned. The manufacturer of the several standard grades on the market would be glad to furnish these tests on application.

The determination of the amount of free tarry matter in the oil is the real factor which governs the amount of carbonization to be expected. The phrase, "Color Test for Carbon," has even been adopted by some manufacturers, meaning that lightness of color indicates freedom from carbon. But while it is true that lightness of gravity is of the greatest importance, it is also undeniably true that lightness of gravity and lightness of color are not necessarily correlative.

An almost white oil may be of a much heavier gravity and contain more free carbon than another oil many shades darker in color. Excessive filtration, while removing the color, may, if carried to excess, remove the lubricating properties of the oil, while bleaching with acid, though having no effect on the lubricating qualities of the oil, may leave an acid residue, injurious to cylinders and pistons.

Since temperature affects oils, it is evident that different results may be expected from oil cups exposed to the heat of summer and cold of winter unless different oils are used. As the temperature near the engine is much the same the year around, oil cups to use the same grade of oil in all seasons should be placed near the motor, where they may receive the benefit of this constant temperature,

out if placed away from the motor and exposed to the outer air, a change either in the quality of the oil or the adjustment of the cup must necessarily be made with each considerable change of temperature. The design of a vehicle has much to do with the lubrication problem, and some vehicles have many less oil cups than others equally capable. If an oil cup is found empty on the road without a reserve supply from which to fill it, there will usually be found some other oil cup containing enough to be divided, thus enabling one to proceed till a supply can be obtained. Graphite is a good lubricant and almost impossible to wear out, but if used in connection with oil, it should be used sparingly, for a thick paste of graphite and oil refuses to spread evenly over the bearing and will permit one part to get dry and cut, although another part near-by may be kept in a good condition. If used on the roller or ball bearings, nothing is better than a paste of graphite and grease. For making this paste vaseline is frequently used, but its lubricating qualities are not so satisfactory as the regular grease prepared for lubricating purposes; the nature of the vaseline causing it to wear out more easily, while it is not of high fire test and not adapted to stand much heat. Dry graphite alone is hardly safe as a lubricant for plain bearings, because of the difficulty of keeping it in position where needed, but if fed constantly in small quantities it serves well. A drop of oil in the right place is far better than a gallon on the ground. Care, therefore, should be taken when oiling with the ordinary can to see that the oil reaches the place for which it is intended and avoid as far as possible spilling it over the parts of the vehicle where it simply gathers dust and disfigures and injures the surface.

While sometimes a warning squeak gives evidence of lack of oil, many times the first warning is a decrease in power, followed almost immediately by a sudden stop. In this event, disconnect the clutches and see that the vehicle bearings are all right by pushing the vehicle back and forth. An operator should frequently test his vehicle by pushing it, so as to know if it is running properly, and this test will show quite fairly the condition of the bearings, brakes and clutches. If the vehicle is all right then test the motor by turning it with compression relieved, noting the regularity of the power.

If stuck tight, so that it cannot be turned, take hold of the fly-wheel and apply power in the reverse direction, pushing backward on the fly-wheel and then forward with the crank. If a stuck piston, it will be possible to find whether the crank shaft moves even a little, as permitted by the slightest looseness in the bearings. If the crank does not move at all it is probably a crank bearing, and inspection and loosening will remedy the trouble so as to permit the shaft to be moved. If a stuck piston, it will usually cool down enough to be movable, but oil should be worked into the damaged place as quickly as possible, and any metal particles should be removed with waste. If on the crank shaft frequently rough spots are found they should be removed with chisel or file so as to prevent further damage being done by the presence of cut-off particles.

Loose Check Nuts.

Loose check nuts on the connecting rods in the braking system may become the cause of a serious mishap. When the check is removed from the turnbuckle or other adjustment which it is supposed to guard, the tendency of the vibration is to loosen the adjustment of the bands. As this may occur while the machine is running, the possibility of having the brakes fail, owing to slack adjustment and without any previous warning, is well worth considering.

LESSONS FOR DRIVERS.

Carelessness and Ignorance Responsible for Most Accidents.

There seems to be more accidents than usual this month because of skidding. Automobile drivers of any experience ought to know the dangers of slippery pavements and highways and of making sharp turns when going at high speed. There is very little danger of doing harm if the automobile skids when going at a slow pace, and the chances of skidding are infinitely increased by speed. This of course is well known to automobile drivers, but they do not seem to take any account of it. Near Dayton, Ohio, two men were driving a car over a recently repaired road, and attempting to make a sudden turn the car skidded and side slipped. It struck a telephone pole, ruined the car and one of the men may die. In another instance, near Moline, Ill., while trying to turn out for a street car a big automobile skidded on the wet pavement, hit the curb, and ran into a fence. Fortunately no one was seriously injured, but the car was damaged to such an extent that it will cost about all it is worth to put it in good shape again. Slippery pavements also caused a serious disaster in Minneapolis, Minn. In this case the car ran completely through a drug store window and the occupants were all cut and bruised. The same day and near the same locality a car skidded on a bridge, struck the iron railing on the side and was smashed beyond repair. In the suburbs of this city a party was going at high speed and in taking a curve the car skidded and side slipped, breaking the rear wheel and finally went down an embankment, killing one well known man and severely injuring four others. Instances of this kind ought to serve as a warning to drivers who have the speed mania. There is not much danger as long as the car can be kept going in a straight direction but it is the stopping and the turning that makes the trouble.

The danger of one automobile closely following another begins to be apparent. In the case of two horse drawn vehicles the rear animal usually slows up of his own volition in case of any obstruction ahead, but of course this cannot be expected of an automobile. Near Waterbury, Conn., the other day two big cars, one closely following another at high speed, were wrecked and several people injured. The cars were rushing along, the people in each keeping up a running fire of conversation and naturally paying more attention to this than anything else. Finally something snapped in the leading car. Of course it stopped, and before the second car could be gotten under control it ran into the other and both cars were pretty well demolished. Physicians set several broken arms and fingers and took hundreds of stitches in scalps and faces.

Will people ever learn that the fumes of gasoline mixed with air are highly explosive and that it is reckless foolishness to take lighted cigars, cigarettes or matches near such fumes? At Providence, R. I., the other day a woman was killed when a trolley car hit an automobile, and several were seriously injured. But a spectacular aftermath of the sad affair came when the car was consumed as the result of throwing a lighted match or a cigarette stump into the gasoline soaked roadbed. The flames flashed to a point beneath the car, there was a report, a cloud of flame and everything except the metal work of the car was consumed. The car was a big and expensive 40 horse power machine. But this was trivial compared to the destruction of more than 100 costly cars in Boston recently. The alarm first came with an explosion in the basement of a big garage where the repair shop was located. Travelling from one car to another

with lightning like rapidity the fire in short order had transformed the first floor of the garage and contents into a sea of flames. In a little short of a trice it had done the same thing for the fourth floor, while the basement was long since a raging furnace. Explosion after explosion of gasoline rent the air, jarring the building to its very foundations, knocking the firemen from their vantage points and showering broken glass and great pieces of burning timbers on the crowds of spectators for a radius of 100 yards. When it was all over it was found that $350,000 worth of automobiles had been destroyed.

It is singular that accidents continue to occur while cranking the car. Of course such an accident could never happen if the position of the ignition, throttle and gear levers were carefully ascertained before touching the crank. Just how many men have had a wrist or an arm broken from carelessly leaving the ignition too high or been run over by his own car by cranking when the gear is in it would be impossible to state. At St. Paul, Minn., recently a man was cranking his car in front of his home, when as soon as he released his hold, the crank swung back with the rapidity of lightning and struck his wrist, breaking it in two places. It will take at least six weeks before he can use his arm again. At Southport, Conn., a man stopped his car and soon after attempted to crank it, forgetting that he had left the gears in mesh. At the first "turn over" the engine started and so did the machine. The man was run down by his own vehicle and carried under the car to a bank nearby where the front axle was twisted and the machine stopped. Another motorist passing saw his plight, stopped and helped him out of his predicament. It cost a good deal to repair the car although the man is not much hurt.

Now the foregoing examples of accidents from careless cranking are not isolated by any means. For of 168 cases of accidents reported to the Travellers' Insurance Company and not of a fatal nature, 61, or almost 37 per cent. were due to cranking.

It is noticeable that in many cases of accident it is stated that the driver ran into a tree or an embankment or a telegraph pole to avoid a collision or running over some person. Now this is all very well, but when a car is being driven at a safe speed nothing of this sort is ever necessary. The car may be stopped before it runs into anything or any one. Of course the distance required to stop a car depends almost wholly upon the speed with which it is going. If, for illustration, it is going but six or eight miles an hour it can be stopped in an emergency while it is going its length, but when speeding at the rate of twenty or thirty miles an hour, to attempt to stop it in twice or thrice that distance is liable to overturn the car and damage the brakes. At Atchison, Kansas, recently, a man was driving rapidly when a tire burst and he threw on the emergency brake. This caused the car to turn two complete somersaults, and the occupant's coat caught in the car in some way and he went with it. When the car came to a stop the man got up, took two or three steps, sank down unconscious, and died ten minutes later.

A driving horse ordinarily cannot travel more than 50,000 miles during his lifetime, even though he does not go lame. Many automobiles cover a great part of this distance in one or two seasons.

Always keep plenty of soapstone on hand. It is the best thing on earth to keep the inner tube from sticking to the casing, and on the clincher form of rims a little sprinkled in the channels makes it much easier to remove a casing.

CANOPY TOPS.

A Few Suggestions About Their Construction, Care and Repair.

BY GEORGE RICE.

Motor-vehicle repairmen are often called up to repair a canopy top, adjust one in position, or perhaps design and construct such a covering. In some of the best equipped shops there is a department specially fitted and in charge of one or more men for handling the tops of

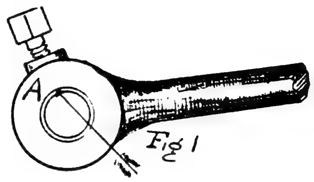


Fig 1

horseless vehicles. In these departments we may find the usual collection of rods, hoods, shields, bows, tops, angles, locking joints, rocking joints, revolving joints, tee joints, curves and various other parts needed in the building, repairing or setting of the modern canopy hood. There is also the bending device for shaping the rods as desired. Likewise there is a Bunsen burner contrivance for welding the metal pieces as needed. There are forming and punching dies for making the joints in the parts forming the skeleton of the metal frame. There are

Fig 2

the sockets for the car frame and all the necessary special and general tools for operating on the hood for the motor-vehicle.

In shops where these equipments are not available it is impossible to do much more than repairing on the canopies. Considerable repair work is required on canopies in nearly all the shops, especially during seasons in which hoods are neded on the automobiles. There are some cars permanently fitted with the canopy tops, while others are fixed for adjustable covers. In addition to the metal work on the skeleton of the canopy, there is always much repair work on the cover. Consequently many of

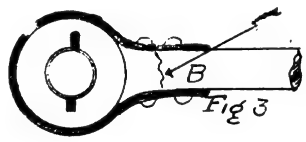


Fig 3

repair men carry a line of repairing devices for sewing and patching tears in the fabric.

Ordinarily the hood in use to-day does not differ very materially in design from the average coach hood. Side-lock joints are used from front to back in both kinds. The bows of the top are made from steel, whalebone and bent hardwood, and in order to effect repairs on these the workman should carry a few extra pieces in stock. The head hinges are usually plated, as they are exposed. The slat irons can be japanned and fixed to the outside bows with bolts. The interior slats are now often made of some wood which can be finished off neatly and attractively. The body prop stays are of course made to fold, and the joints should always be free. As soon as the joints gum and clog, the inmates of the motor-vehicle have as much bother utilizing the canopy as the

passenger has with the annoying tight window in the railway car. The parts should all be free in operation. Sometimes the hood is folded back and left there considerable time during a clear season of weather. Every time the car is in the shop the canopy top should be opened, the dust shaken out, the joints oiled, and the

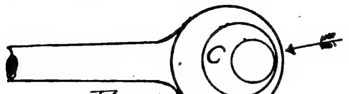


Fig 4

whole top put into order. Many persons wait until they desire to use the top to protect from rain before opening the same.

In Fig. 1 we show one of the joints fitted with a set-screw point A. Attention is called to this joint because often the set-screw is turned in too hard. Sometimes the pressure fractures the bearing. Often the point is made to turn in a groove cut in the stud, and this holds the bearing in place. A better system is shown in Fig. 2 in which the bearing fixture consists of the stud with the

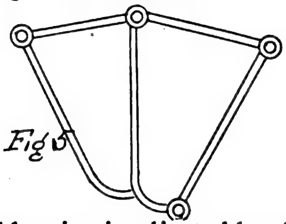


Fig 5

flanges. The rod bearing is adjusted by clamping over the flanges and is thereby supported in place without the aid of the point of the set screw.

In the event of the metal shaft breaking off as at B, Fig 3, and if no extra part is available, the shaft can be repaired by pinning a strip of strap metal over the whole affair, as represented by the darkened portion.

I found cases in which the joints in the top frames of certain motor-vehicles were working badly due to the excessive wear of the connecting parts, as shown at C, Fig. 4. In cases like this a new joint should be substituted, and undoubtedly would be, if the parts were in stock. If not, the entire worn opening of the bearing

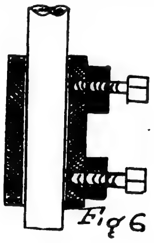


Fig 6

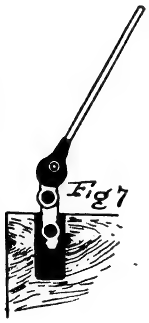


Fig 7

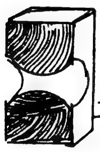


Fig 8

may be plugged and a new hole bored of the right size for the pin.

Fig. 5 shows a popular construction of the rear irons with slug fittings and support. Fig 6 shows in detail one of the locking joints in which two set-screws are turned in on the surface of the inner rod for the purpose of biting the same and holding the rod in position. Fig. 7 shows a lock-joint connection with the body of the car, and Fig. 8 one of the vise-bending contrivances. This is simply a block of hardwood cut with the hour-glass shaped center through which a rod may be passed and bent cold by pressure. The block is held securely in the jaws of a large vise meanwhile.

Why Tires Are Cheaper.

First, the middlemen's commission has received a severe pruning. Heretofore the supply man, the garage owner and those who sold tires to the consumer were given a good margin to make up for the amount of money that had to be invested in a stock. This the dealer used as a basis to allow of the cutting from list prices, and the consumer who took these prices for granted as being the regular retail price was paying more than the consumer who went from one place to another, driving a hard bargain on his tires. This, the manufacturer felt, was an injustice, for the consumer who would pay list price was the class that the manufacturer wished to cultivate and protect. So to make it impossible for the dealer to cut prices, his margin was reduced. The second reason for the reduction is that the experimental stage has been passed. In figuring out the price for the coming year, the manufacturer has not made an allowance for experimental work. Lastly, there has been a reduction in the cost of manufacturing, for within twelve months machinery has been invented which will increase the output of tires ten to one over last year, at practically the same cost. Of all concerned, the dealer is the only one that will not be benefited by the change in price.

Hard and Soft Tires.

There are certain facts in connection with both hard and soft tires that should not be overlooked.

Hard tires are less liable to puncture and they are less liable to injury from a side wrench when taking a sharp turn.

Soft tires are less liable to skid, they ride easier, they require less power for propulsion, and they wear less.

The fact is, like a good many other things of a similar character, an extreme in either the direction of undue hardness or of softness, is objectionable. We are of the opinion, however, that on rough highways, a tendency in the direction of softness, provided it is not sufficient to ever allow the rim to strike, is better than to have the tire too hard. It will be found that the less the point of contact with the surface of the road, the greater will be the tendency of the tire to skid, and of course there is nothing that wears a tire out faster than skidding.

On the other hand, the general tendency is to run the car with tires too soft rather than too hard.

The Left Hand Favored.

In cranking the man who uses his left hand has the advantage. Grasping the handle as he does with the fingers curved, when a back fire occurs the arm is thrown outward, the fingers are opened, and no damage is done. Again, the left-handed operator squarely faces the car, and by reason of the distances between his feet, and a firm grip on the radiator or dumb iron with his right hand, it is next to impossible to throw him from his balance. The hand grasping the dumb iron also assists in the exertion of more strength on the starting crank. This question of using the left hand has been discussed by several doctors and constructors, and they favor the use of the left hand for the foregoing reasons. And now two French manufacturers are training their mechanics to use the left hand in starting. With low tension ignition it is essential that the motor be turned over quickly in starting, and this can be more readily accomplished if the left hand be used. Of course there should be no back fire, but it is well enough to have things in such shape that when one does occur it will do a minimum amount of damage.

If you find what you want here, please tell your friends about it.

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ADVERTISING RATES MADE KNOWN ON APPLICATION.

NEW YORK, OCTOBER, 1908.

Missing Numbers—Our readers are requested to remember that it always gives us pleasure to re-send numbers which have gone astray in the mails.

A MATTER OF ECONOMY.

No dealer should lose a single customer because of the alleged high cost of maintaining a car, either for repairs or for expense of propulsion.

Mile for mile, the cost of running a car is les than running a horse-drawn vehicle. In making this comparison, the life of the horse, the cost of his shoeing and of his keeping and grooming, and the running life of the carriage must be considered as well as the wear of the pneumatic tire. In making these estimates fairly, the automobile will invariably show the more economy.

And as to durability, where is the horse-drawn vehicle that could have been taken over the route from New York to Paris and yet be of any value whatever on its arrival, and this no matter how slow the rate of speed? Where is the horse-drawn vehicle that could have been taken through Australia, 2,000 miles, and in a roadless country the greater part of which was a sandy desert and a trackless waste?

Durability? What more can be asked or expected than this? Not long ago a car was driven 12,189 miles in 100 days. It was then taken apart by experts and a most thorough inspection made of every piece. The valve stems and motor bearings were calipered, igniter parts were examined for wear, timing gears were measured, observations were made on the accumulations of carbon in different places; the multiple disk clutch, the gear set, brakes, universal joints, axles, universal joint—everything in the car—and not a single case of breakage or distortion was found, while the wear was wonderfully little. There was no warrant for a single replacement.

The fact is, at horse speed the average automobile if given decent care, will last for years without repair.

As for the safety of the automobile, if driven at no greater speed than the horse there is far less danger than in riding in a horse-drawn vehicle. It never shies, it never bolts, it never balks, and it always goes just where it is guided when driven at the same speed horses are driven.

Horses will soon be relegated to the domain of luxury, where they will furnish amusement and diversion for the rich. The automobile is to be the carriage of the common people. It will gradualy put the steam railway passenger trains out of business.

The dealer may and should be fortified at every point to demonstrate the economy of the automobile when compared with the horse.

IMPORTED CARS.

Either the duty on automobiles coming into this country is less than it should be or certain purchasers of cars are not showing the good judgment that should mark such a transaction. According to reports issued by the custom house authorities of New York, 290 automobiles of the total appraised value of $687,354.85 were imported during the month of September last, while 1,179 cars, valued at $2,693,186.06, were imported this year up to the first day of October. Of course New York city is by far the largest port of entry for automobiles, and quite likely it is the only one of any consequence.

But disguise it as we may, this something over two and a half million dollars that went out of this country for automobiles should have been expended right here at home. The competition between the hundreds of manufacturers in this country is sharp enough to insure getting the very best value measured by the expenditure, and the range of styles and qualities of cars of home manufacture is sufficiently wide to meet any taste or purse.

Of course there are many who prefer the imported car, no matter what the cost may be, and this class serves to greatly swell the large total of importers. To many, the term "imported" has a distinct value, and this feeling is manifest in various forms of expenditure for foreign made goods when the domestic would answer every purpose and would cost less.

But if this imagined superiority be set one side, we hardly see how there could be such an enormous importation of cars. We do not maintain that the American manufacturer can yet compete in price with the foreign makers. American wages for skilled mechanics and American cost of living are too high for that. But it is an undoubted fact that no one can pay the 45 per cent. duty charged and get anywhere near as good value in an imported car as in an American car at the same cost.

FLAGRANT CRIME.

A recent issue of a New York evening newspaper had more than one-half of its first page occupied with accounts of automobile accidents, and here follow some selections from three different "scare" headings:

"Kill man with racing car, hit woman, laugh and flee."

"Chauffeur runs down two policemen. Pursued driver turns car on them and knocks them unconscious."

"Man dying, four hurt by racing automobiles."

Offences of this kind are so rank they "smell to heaven." In but one of them is there the slightest chance of apprehension, and in one instance the miscreants with murder in their hearts had removed the license number of the car they were using as a forethought of what was likely to happen. Just what steps should be taken in order to abate such flagrant crimes it is difficult to say, but possibly imprisonment in any kind of an accident where an innocent person is hurt might have a good effect, and whenever an accident occurs wherein the license number of the car is found to have been removed, the criminals should be ranked with incendiary fiends and be punished accordingly. Every decent automobile

owner or user would welcome such steps. There is no reason why the most useful vehicle for travel and transportation should be obstructed and interrupted in its progress toward universal adoption.

WIRE SPOKES.

There being considerable good evidence that wire spokes are better than those of the artillery type, all things considered, it is a little singular that we see so few cars equipped with them. And this is especially true when we consider that for equal strength the wire wheel is several pounds lighter than that of wood. For there is no place where weight counts for so much as at the wheels, and especially at the rim of the wheels.

It has been claimed that pneumatic tires stand better with wood than with wire spokes owing to the less rigidity of the wood spokes or wheels, but if made right, the wire spoke wheel has all the elasticity necessary. A few years ago bicycle manufacturers substituted wood spokes for those of wire, and it was at first thought that the change was a good one. Not long after, however, they all returned to the wire spokes, and experienced wheelmen acknowledged their superiority.

A PERMANENT BUSINESS.

There is no longer the slightest doubt that the automobile has not come to stay and will finally supersede the horse as an economical and convenient means of travel and transportation.

In the suburban region outlying the city of New York fully ten cars are already seen to one horse-drawn vehicle, and the purchase of an automobile in its application of money to the best advantage is no longer debatable.

Of course horses will still be used for years to come by those who can afford them and who so justly admire them, just as are other rational luxuries. But we want again to urge the dealer and the repair man to get into their business just as if it were a coming and a permanent one. Lay a good foundation, gentlemen. It will pay you to do so.

Necessity for Attention.

In the case of a horse-drawn vehicle if the wheels are in alignment and the axles are well oiled it will run all right and need no further attention. But this is not the case with an automobile. The engine is an important consideration and needs intelligent and constant care. Lazy chauffeurs often complain that a car is good for nothing when as a matter of fact the chauffeur had as fine an engine as one could wish for. It no longer delivered the goods because it did not receive proper care. The moment a good driver notices a loss of power, he immediately proceeds to locate the cause of the trouble and if he is on to his job he will find out what is wrong in a short time. It is frequently the case that valves become sooty. After a car has been run 3,000 miles it is time to pull down the engine and give the cylinders a thorough cleaning. The lazy chauffeur knows all about this, but instead of putting on his overalls and jumper and making his motor as good as new and giving it proper attention, he tells his employer the car is wrong.

A clean engine will give at least 25 per cent. more power than a dirty one, and the experienced, reliable chauffeur takes pleasure in seing that he has no loss of power when he comes to a tough hill or a sandy bit of road. When a tour is being made through the country the chauffeur should spend an hour or so every morning with his car. He will always find something worth while doing and will always be better prepared for the day's journey. That is why his car stands up, while an equally good car receives a bad reputation from the indolent chauffeur.

Testing the Brakes.

The rear wheels should be tested frequently to see that they revolve freely. It occasionally happens that friction exists in the transmission gear or because the brakes bind. In the ordinary course of things these points are generally overlooked until discovered casually. Sometimes the brake shoes, either on the cardan or countershaft, as the case may be, or in the drums on the rear wheels, do not clear when the brake is released. Occasionally, too, the release springs, if used, are weak, or one of the connecting rods rubs against the frame, etc. Or it may be that the brake shoes are covered with congealed oil, in which case they cannot clear the drum easily. The friction which is set up from one or other of these various causes not only hinders the speed of the car, but sets up abnormal wear. In some cases the addition of a small pair of release springs on the rear brakes has proved very beneficial when the shoes are inclined to rub on the drum. But before trying this plan, the shoes should be examined in order to see that they work freely. If required, the springs can be easily attached, and are cheap. It sometimes happens, however, that no mechanical cause for loss of brake power can be found, and so some other cause must be sought. Occasionally the fault arises from an abnormal quantity of grease on the shoes. The rear brakes seem particularly liable to this trouble, as a great deal of grease often escapes through the live axle and settles on the drums. Road grit is soon picked up and burned by the heat, so that a hard, compact mass is formed, which effectually destroys the checking power. Another reason for the falling off of brake power is that when the frictional surfaces are worn the shoes may not be able to make sufficient contact with the drums on account of some projection in their neighborhood. A close search will sometimes reveal a slight obstacle such as the edge of a nut or shoulder of a bracket that only needs easing off for efficiency to be restored.

For a Leaky Exhaust Joint.

In case of a leaky joint in the exhaust, asbestos string is not a good packing. The radial pressure of the exhaust at these joints is greater than any one would imagine, and it will soon blow out any string packing, unless the studs and nuts are big enough for an enormous wrench to be used in tightening. Use in all such repairs asbestos card, cut into proper washers, with a central hole fitting the pipe bore, and side holes for the boltheads to slip through. These packings will last a couple of years and never blow out unless the nuts are allowed to work loose. The reason string is often substituted for card is that an extra joint has to be taken down to spring the flange off the studs, so that the washer may be slipped in; but the additional trouble is labor very well spent.

Sticking Gear Case Parts.

When separating sections of gear-boxes or crank cases, it will sometimes be found that the parts stick together after the bolts have been removed. Care should be taken in separating them, especially if the parts are of aluminum. Driving a chisel or screwdriver between their edges may make a nick which will spoil their oil-tight fit, or a burr may be raised which will prevent the parts from coming together properly. The application of too great force may cause the parts to spring. Gently prying at a large number of points after the stuck parts have been tapped all around with a light hammer will generally separate them without damage.

THE REPAIR SHOP

BACK FIRING.

The Cause Simply Explained and How to Cure It.

BY SYDNEY F. WALKER, M. E.

By back firing is meant premature ignition. In order that a gasoline engine shall do its proper work, and give its full power with a given charge of gasoline, it is necessary that the charge of gasoline vapor and air shall be fully compressed before it is ignited. In the ordinary four-cycle engine, as the great majority of gasoline and gas engines are, the operation is divided into four sections, each section corresponding with the movement of the piston from one end of the cylinder to the other. In the first section, or the first stroke, the outgoing stroke, the charge of gasoline and air are sucked into the cylinder. On the second stroke, when the piston is returning, the admission valves are closed, and the mixture is compressed in the rear end of the cylinder. In vertical engines, the rear end is the upper end. The third stroke, the second outgoing stroke, is the active stroke of the cycle. It is during this stroke that the work of the engine is done, and in any measurements that are taken by the indicator, etc., it is the number of explosion strokes only that count. The explosion should be taken at the commencement of the outgoing stroke, immediately after compression. Under certain conditions, it is convenient to take the explosion a little before, or a little after the completion of the compression stroke, but it must be distinctly understood that when this convenience is made use of, as by advancing or retarding the spark, the engine gives less power for a given charge, and usually less total power, under any conditions, than it can do with ignition at the proper time.

It sometimes happens that ignition takes place before the compression stroke is complete, and this is what is meant by back firing. When this happens it will easily be understood that the full force of the explosion stroke is not obtained. In order that the mixture of gasoline and air shall do its full work, it must be fully compressed, and it is not fully compressed until the piston has reached the full length of the compression stroke. Firing can take place immediately the charge begins to enter the cylinder, and in very bad cases that is what takes place with, in some cases, very troublesome results. It will easily be understood that if the head of the charge—the head of the column of gas and air that is being admitted—is ignited, the remainder of the charge will be burned, as it comes into the cylinder, and while a certain amount of expansion of the mixture takes place, the effect for driving the engine is nil. The charge may be ignited from the time when the admission valves are first opened right up to the proper time when ignition should take place, and the reduced effect produced will be in direct proportion to the time the charge is ignited before the end of the compression stroke.

THE CAUSE.

The cause of pre-ignition is the presence of heat, in some form or other in the cylinder, sufficient to ignite the charge at the moment that back firing takes place. The heat may be due to several causes. The cylinder itself may have become very hot, owing to the failure of the water circulation, or in the case of air cooled engines, owing to bad design and to the engine having been worked very heavily.

A somewhat fruitful source of the heat necessary to ignition, is the formation of a deposit of carbon in the cylinder, usually near the valve end, the deposit being produced by an inferior brand of lubricant, and the carbon of which it is composed being raised to a temperature sufficient to ignite the gaseous mixture by the explosive action of the charge itself.

Another source of the trouble is the formation of pockets in the rear of the cylinder, in which a mixture of gasoline and air is stored, after the completion of the exhaust stroke, the mixture not being driven out with the products of combustion, and not being burned with the remainder of the charge, and being in a sensitive state, the heat generated in the charge by compression, is sufficient, in those cases, to ignite the mixture in the pocket, this small body of gas igniting the remainder, and causing premature combustion. Cases of this kind should not occur in properly designed gasoline engines, but they have been reported, in particular where pockets have been arranged for the sparking plugs, and with fixed engines. A case was reported a little while back in which back firing took place while the engine was being indicated, owing to the presence of the gaseous mixture, in the passages made for the indicator. When the indicator was not in use, these passages were plugged up.

Another source of back firing is too great an advance of the spark. As explained above, it is a convenience to be able to advance or retard the time of ignition, by advancing or retarding the time at which the spark passes in the gaseous mixture. It forms a convenient method of regulating power, though it is a wasteful one, and should only be applied to a limited extent. It will be easily understood that if the spark is advanced to an excessive amount, the charge will be ignited so long before complete compression is effected, that the phenomena known as back firing will result. It is also possible to retard the spark sufficiently to produce the same results.

THE CURE.

The cure of back firing is practically indicated by the cause. If a motor car comes into a repairing shop, complaining of back firing, the water circulating system should first be examined, and if that is all right the spark adjustment should be examined, and if that is right the cylinder should be opened out, when probably the hot deposit of carbon will be found.

One possible cause of back firing may be mentioned. Occasionally a deposit of dirt takes place between the points of the sparking plug, or upon the wires forming the points, in the neighbourhod of the ends. This may also lead to a premature ignition, just as the deposit of carbon from the lubricant does.

Sight-Feed Oilers.

If it is difficult to observe the rate of flow through sight-feed oilers mounted on the dash, it is a good plan to slip a bit of white paper behind the tubes, thus giving a light background against which the contents of the glasses will show with considerable distinctness, even in a poor light. If it is desired to make a permanent arrangement of this nature, the paper should be neatly cut to a convenient size and varnished to the dash.

WORKING UNDERNEATH.

How Cars Are Often Strained by Careless Raising.

MR. GEORGE RICE, MELROSE HIGHLANDS, MASS.

While motor-vehicle machinists ought to and do know better, some of them put their cars to a severe straining test by hauling or boosting one end into the air occasionally. The object is to get at the works below. In many of the shops there are pits over which the car is run when any underneath work is to be done. The pits are deep enough for a man to work in and are liberally lighted. In some of these pits there are benches, tools and mechanical devices for working at the bottom mechanism of the modern motor-vehicle. But the pit project is not used in some places. Instead, when there is need of getting at the bottom of a car, strenuous and oftentimes unnecessary work is done. I have seen first-class cars hauled upward by the hind leg, so to speak, by means of a block and tackle.

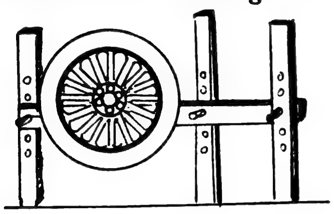
FIG. I.

It would hardly seem possible that such a condition could prevail in a modern repair shop. But when the machinists are obliged to get at the bottom of the car, some feel that it is necessary for them to adopt some means for the elevation of the same. The owner may be in a hurry. The shop has no working pit. It may not even possess a common jack. Emergency means and ingenuity are used to get the machine body in the air so as to give space below to work in. Oftentimes the strain on the frame of the car is something terrible. If a rope is placed about each rear tire, then the back of the car is lifted evenly. But in a case I witnessed only a single rope on the one side was used, and the greenest mechanic could readily observe the effects of the twist on the frame. It semed to me that all of the bearings were slightly tilted and sprung because of the dead weight hanging to the supporting point. Furthermore, the mechanic at work on the job did not hesitate to help ruin the car frame by hammering in such a way that a swinging motion was created. The slight vibrations disturbed the adjustment of every union in the mechanism of the machine. It could not do otherwise. When the car was lowered the result of the strain was shown at first by the fact that the wheel which was pulled up did not contact with the level floor as hard as the other wheels for several minutes. Gradually the sprung frame of the car settled back to its original position.

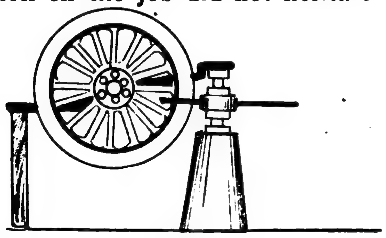
FIG. 2.

Then when in haste to work underneath, boxes were used under the ends of each rear wheel hub. The boxes were packed with iron parts of machines and therefore were solid and strong. The hubs of the wheels projected just enough to permit the tips to rest on the edges of the boxes. While this method supported the rear of the car well, there was danger of some one disturbing the boxes and allowing the car to drop on the machinist working below. In addition to the danger, the plan lacks in mechanical setting. The frame of the car is strained, just as in the first example. When boxes are used, you have to find boxes just the right thickness, or make your elevation too high or too low.

Blocks may be seen in use in some shops. In fact, you can find instances of use of bricks and what not. There are various ingenious contrivances utilized for this work, one of which consists of a set of three uprights of hardwood, drilled with adjusting pin holes as shown in Fig. 1. Then a cross of supporting pieces with corresponding holes is used in the manner shown in the cut to support the axle. I have also seen various forms of screw jacks in service in various ways, one of which is shown in Fig. 2. Here the screw jack is employed beneath the end of a wrought iron piece, which wrought iron piece passes below the shaft of the wheel of the car as shown, and rests with its terminal on the top of a post. It is easy to raise and lower the car by simply turning the screw jack.

TRICKS OF THE TRADE.

Some Swindling Operations That Have Entered the Business.

A young enthusiast who recently bought his first machine fell into the hands of an unscruplous but not uncommon class of repair men the day he started on a long run into the country. He had traveled not many blocks when a rattling noise under the seat indicated trouble. As mechanics were like a sealed book to him he did not stop to investigate, but ran his machine for the nearest garage, in hope of reaching it before something worse would happen.

The man in charge, before doing anything, cautiously asked a few questions. On discovering the owner's ignorance he suddenly became active and began to look things over with an air of great wisdom. The seriousness of the damage done was impressed upon the young man by an investigation lasting twenty minutes. After a consultation between the garage man and another in the back room, who seemed to be his partner, the owner was gravely informed that it would take two or three hours to get the machine in proper working order. Apparently things were in a bad way, but all they did was to put on a nut ordinarily sold for ten cents, for which he was charged $8.

Another man stopped in the same kind of garage to buy gasoline. While talking with one of the men in the rear of the shop some one connected with the place quietly took a wrench and loosened some of the parts. Of course the owner noticed that something was wrong after he had gone on for a block or two. Quite unsuspicious of the real cause he went back to the garage to find out. The men lost no time in showing him, but they did it in such a way that he was more confused than if he had tried to make the repairs himself. They took off the tonneau and spread the parts of the machine around on the floor until the place looked like a junk shop. When finally everything was put back in its proper place they charged $25 for their services and gave him to understand that he was being left off easy, they had had so much trouble.

Such a lively interest in the contents of somebody else's pocketbook felt by men like this is directed to each other's purses as well as the public's. A case in point is that of a man whose machine was badly wrecked in an accident on Long Island not long ago. At the repair shop the man said that the number of expensive parts necessary to re-

place would bring the bill up to $100. Pipes, rods, &c., presented such a mess to the automobile owner's unmechanical eye that he readily believed what was told him, and the mechanic was allowed to go ahead with the repairs. The man had a partner, it seems, who had gone to New York early in the day and was not expected back until evening. Before he returned the automobilist had paid his money and departed. Only half the sum, however, reached the till, the rest of it going into the pocket of the enterprising machinist. Probably no one would have been any the wiser, as the owner of the machine was never seen again in that neighborhood. But the fellow who could not make money fast enough out of the public to keep his hands off the other man's share took a little too much to drink in the town barroom one evening and told what he had done. The story soon got to the ears of the other man.

If these predatory mechanics, who are the exception, find the pickings better than usual and accumulate enough ready cash to operate on a large scale they sometimes try to persuade automobilists with uncut wisdom teeth to sell damaged machines for almost nothing, and if one of the partners is as enterprising as the one just mentioned he never misses a chance to get a private "rake off" all around. This happened in the case of another owner whose new machine got into a heated argument with a large bowlder along the roadside and came out second best, when miles away from the nearest town. Finding a surly farmer, whom he induced to haul the remains to a garage ten miles away by handing over all his spare cash and by the promise of a house, lots and diamond rings, besides a life annuity if insisted upon, the automobilist at last reached the only place where there was a garage.

After all this trouble he received the cheerful information that the machine was only fit for the scrap heap.

"Well," said the disconsolate owner, "it will cost more than it is worth to ship it back to New York if it is as bad as all that."

"I could use some of the parts in repairing other machines," suggested the garage man.

This led the way to negotiations for the whole machine, and after frequent trips to the telephone on the part of the garage keeper to consult with his partner, who had gone to the next town, the automobile changed hands for $400. But in the conversation at the 'phone, situated in a quiet corner, the man at the other end of the wire was made to believe that the machine they were buying to sell again at second hand for $900 would cost them $600. As a result the man who had conducted the negotiations with the automobile owner pocketed the extra hundred dollars supposed to be paid out from their common funds, besides getting his share of the profits when the machine was repaired and finally disposed of.

To Clean the Upholstering.

Cars that are upholstered in light colored leather frequently present an appearance of untidiness which can be easily overcome. To clean and remove stains from light colored leather the following mixture may be used with good effect: Boil a pint of milk; let it cool and add one drachm of sulphuric acid; shake well and then add half a drachm of oil of lavender, one pine of vinegar and the white of one egg beaten to a froth. Keep in a tightly corked bottle. Rubbed on the leather with a soft cloth it improves the appearance and removes spots or discolorations.

It is much easier to accurately guide a car that is equipped with a big steering wheel. Notice the wheels of the racers—how ample in size and how correct the shape of the rim.

REPAIR WORK.

Little Things That Save Time, Money and Labor.

Possibly the following information relative to small repair work may be of interest to some of our readers. Many of the points are of course already known, but it is expected that some at least will be new:

A washer of a specific thickness is often wanted, for instance, to take up a small amount of backlash or endplay in a shaft. In a case of this kind use a washer thicker than required and carefully file it down. To do

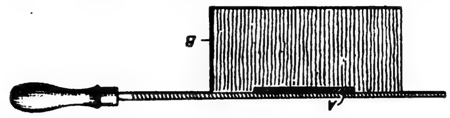

FIG. 1.

this sounds easy, but, handled in the ordinary way, is difficult to deal with. If one tries to grip it in the vise by the edge it either springs out or rocks about in an annoying manner, and, in any case, it is impossible to file a washer thin and flat in this manner. The operation is made easy if the washer is first passed between the jaws of the vise into the surface of a piece of soft wood endwise of the grain, as shown at Fig. 1, A being the washer and B the wood. In filing the wood and metal are cut away together, and if one can handle the file at all well the washer can be removed from its bed as true and as thin as may be desired. For enlarging the centre hole, if necessary, as large a round file as can be got through should be used, and with a little care a hole can be made that will be as true as if drilled. For making very thin washers use sheet phosphor-bronze, which can be obtained from 1-64th inch down to the thinness of tissue paper. Using a pair of spring dividers, one can strike out any size washer in a minute or two.

A useful material to have about the repair shop is a few feet of the thin soft iron strip, from 3/4 to 1 1/4 in. wide, which is used on the edge of packing cases. It can

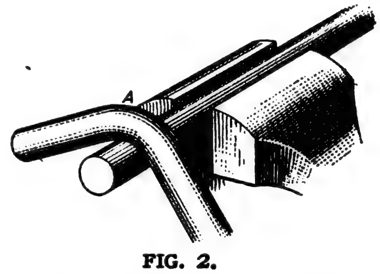

FIG. 2.

be fashioned into excellent clips by the aid of the pliers and a round metal bar of suitable size on which to bend it. Among the box of spare nuts and bolts there should always be a dozen or so 3-16ths round-headed bolts of various lengths, with square nuts, and then one need never be at a loss for a clip.

A usual repair shop operation is making a sharp bend in a copper pipe. If a new carbureter is being fitted, the novice usually makes the bend all right, but stops the pipe up at the same time. To make a really good bend requires care and experience; for anything over 5-16th in. diameter the pipe would have to be temporarily filled with lead. Good bends can be made by heating the pipe at the desired place, at A (Fig. 2), in a Bunsen flame till red hot, and cooling in water, and then bending a little at a time round a bar held in the vise, as shown. The amount of constriction at the bend is very slight, especially after touching up with a ball-pein hammer.

A small taper pin is often required for some part of the engine. The usual way to make it is to file it up from

a piece of steel rod in the vise. Unless skillfully done, a lopsided, ill-fitting pin is the result. A better plan is to grip the hand-drill, which every complete tool outfit should contain, firmly in the vise, fix a piece of steel rod of suitable diameter in the chuck, arrange a notched piece of wood, at B (Fig. 3), under the steel rod, and file it down with the right hand while one turns the drill handle with the left. By this means as well-fitting a pin can be made as if turned up on a $300 lathe.

Some repairmen have experienced difficulty with a tight-fitting bolt or screw, perhaps a sparking plug, and it is rare that one is provided with suitable stocks and dies to ease the threads. But by patient use of a "V" or knife-edge file worked slowly along the thread, turning the latter round meanwhile, it can always be eased down to a working fit, as shown at Fig. 4. The right kind of file, however, must be used—a half-round file will spoil the thread. This method is also useful for touching up a burred thread, so often the result of gripping a bolt or threaded part in the vise without any protection over the jaws, the fine steel teeth of which, being dead hard, will crush anything softer.

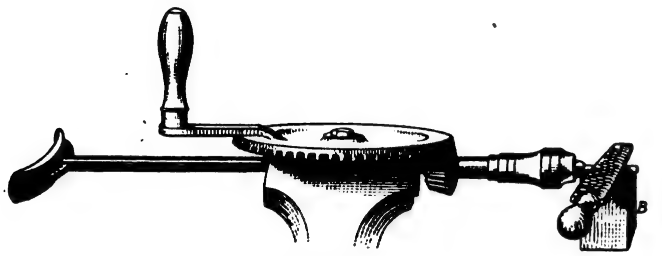

FIG. 3.

Clamps over the vise-jaws should invariably be used when any finished work has to be gripped. A pair can be made in a few minutes from a piece of soft sheet copper, although for some work sheet lead clamps give a better grip. A good hold of a circular bar cannot be obtained by simply gripping direct between the jaws, as the pressure is practically only along a line, and moreover it is risky with a tube, as this is likely to be crushed. A pair of wood grips can easily be cut from two oblong pieces of hard wood, two semi-circular channels being made large enough to grip the largest circular piece likely to be used. Smaller diameter work can always be lapped round with paper to make it fit. Handled in this way, a bar or tube need not have a scratch left on its surface after leaving the vise.

In drilling holes, there are a few points to observe. Fluted drills are the best, as twist drills are liable to grip in the work and often break, especially in drilling through a piece of thin metal. A drill should be really sharp; blunt drills cause extraordinary exertion for little result, whereas a sharp one requires only a moderate pressure to work. Brass, gunmetal, and cast-iron are best drilled dry, and wrought iron and steel with a little thin oil on the drill point. Some kinds of cast-iron are exceedingly hard on the surface, and the drill at first will hardly make any impression. Making a deep center punch mark will generally facilitate matters. When a large hole, say from $\frac{3}{8}$-in. to $\frac{3}{4}$-in. diameter, has to be made, it is better to drill a small hole first, really a pilot hole, to guide the larger drill, otherwise there is great risk of the large drill running all to one side of the spot desired. Hard steel, of course, cannot be touched with an ordinary drill, the metal must first be softened by leaving in the fire till just an even red heat is reached, and then burying in sand till it cools. Rehardening is not so easy, as some parts split or twist easily when plunged at a red heat into cold water. Caution must be used in the operation. Quenching in oil is safer, but the part cannot be made so hard.

The metal saw is a very handy tool, but the hardened steel blades are exceedingly brittle, and any twist or

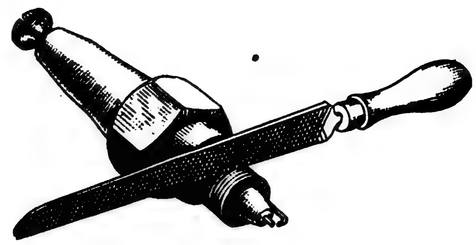
FIG. 4.

crookedness in the sawing operation causes a breakage. The fine-toothed blades should be used for iron and steel and the coarser ones for brass and soft metals. For cutting through a brass or steel tube use a fine-toothed blade, as the teeth rip off the coarse ones. Before sawing make a true circumferential line round the tube where the cut is desired; then, by turning the tube round a little between each cut, the latter will be nice and straight. The broken blades are useful at times for small repairs, as they are readily softened.

Spiral springs are so readily obtained in a large variety now that it is not often one is at a loss for one. The occasion may arise, however, and it is worth keeping in mind that the hand drill fixed in the vise, as shown in Fig. 3, makes a first-rate winder for small springs, using a piece of round steel rod as a mandril. Steel spring wire of various gauges can usually be obtained at hardware dealers.

There are occasions where time would be saved if it were not necessary every time to find a screwdriver of a certain size to unfasten a small screw. Take the cover of the carbureter float chamber, or the cover of the contact make and break, lubricater fitments, or any part fastened

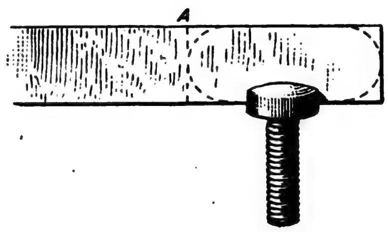

FIG. 5.

with a few small screws. It is a very simple matter to convert an ordinary screw into a thumb screw, and it will be found well worth while to spend a little time in effecting the change. Obtain a narrow strip of hard rolled sheet brass (or strip iron) a shade thicker than the slot in the screw, and half to three-quarters of an inch wide. Trim the edge with a file, that is one end of the strip so that it may be knocked tightly and squarely in the slot of the screw, as shown in Fig. 5. Now hold the screw, supported on the strip, in the Bunsen flame for a few moments and touch the edge near the slot with a stick of zinc or "killed spirits." The solder will run in and around the joint, making all strong and secure. Cut off with a cold chisel at A or nick across with a file and trim the corners with a file (Fig. 6) Hexagon head screws may be done in exactly the same manner if a slot is first carefully cut across the center of the head with the metal saw.

Making good connections to the end of wire cables is a bugbear at times. A very good one may be hammered

out of soft copper tube, as shown in Fig. 7, the sketch being self-explanatory. The cable is stripped and pushed into a short piece of copper tube of suitable size, which is first pinched in in the vise jaws, thus effecting a good grip of the bared wire strands. Then holding the copper piece on an anvil or iron block in the vise, spread it out with the hammer, drill the hole to suit and saw or file through, finally trimming up the face and edges. Such a connection is practically everlasting and easily detachable without having to take the terminal head off.

In straightening of a spindle, light shaft, or valve stem that has become accidentally bent, hammering the piece straight is crude and unmechanical, and generally results in bruising the piece. A better way is shown at Fig. 8. For this it is necessary to have a really good and strong parallel vise, as the straightening operation may easily cause a cheap cast-iron vise to snap across. Cut or file V notches in three hexagon nuts, lay the bent piece in the vise jaws as shown, with the nuts as supports and fulcrum. Apply steady pressure with the vise screw and the piece will straighten out. The vise with its strong square thread and handle makes an exceedingly powerful compound lever. Up to ¾-in. diameter steel can be trued up if the piece be heated red and the blocks quickly manipulated in position. In actual practice it is not probable

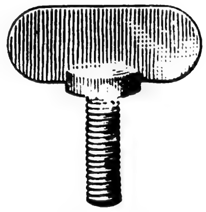

FIG. 6.

that an exhaust valve would become so much bent as that shown in the sketch, so that no more than a very moderate pressure applied at the right point would be necessary to bring it true again. A practiced hand would know almost by a glance along the stem and twisting the valve in the fingers whether it were true or not. It is better for the unpracticed hand to test the piece by laying an ordinary steel straight-edge along it and noting whether it agrees with it.

A most useful accessory in the motor-house is a heavy block of cast-iron; it is almost invaluable to the amateur doing his own repairs. Get a local carpenter to make a pattern in pine wood of the size of block required—a useful size is 8 in. square by 4 in. deep. Send it to the nearest foundry, and have a casting made. If one face and

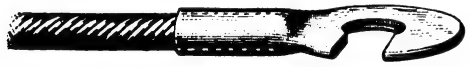

FIG. 7.

edge of the block is planed up it will make the block more valuable still, as the two surfaces enable rough or fine work to be dealt with at will.

Those who like to fit up their own accessories and small improvements on the car often require metal brackets, angle pieces of a certain size and shape. These are quite easy to make in the motor-house with the ordinary tools and vise out of soft-rolled brass or iron strip from 1-16th to ⅛ inch thick, and this strip is so easy to obtain in a variety of widths from any metal warehouse that it does not pay, except in an emergency, to cut up a sheet. If brass is used, it had better be made quite soft by heating to redness and plunging into water. To save time and avoid waste of material, always make a thin card-board templet or pattern of the fitting required and work to it. In most cases the holes for screws may, with advantage, be drilled before bending the strip in the vise.

Copper wire is a material no motorist can afford to be without, in view of the numerous temporary repairs that can be effected with it. The right sort of wire should be obtained; that is, it must be the soft ductile kind, and not the hard-drawn variety, which so easily twists off and is very difficult to manipulate. A variety of thicknesses from No. 12 to 18 gauge is most useful, but one should never be without a good length of the special tinned copper wire, No. 22 gauge, as used by electricians. It is surprising what repairs can be made with it by the exercise of a little ingenuity on broken gasoline and oil pipes

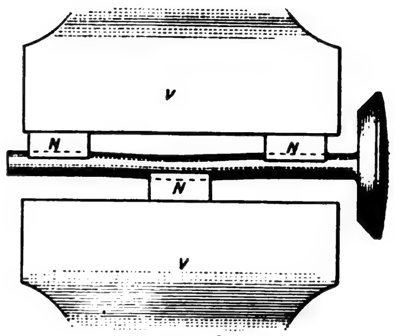

FIG. 8.

and many ignition parts. A gasoline pipe, which had a bad split in it, may be permanently repaired by cleaning the surface of the pipe with emery cloth and wind closely over the damaged part a layer of the tinned wire and soldering it up. The tinned surface makes the soldering perfect and easy. It is useful material also for plugging up or covering over a hole in a radiator, petrol tank or lamp reservoir. to make a good soldered repair.

It is often the case that valves become short in the stem from the constant hammering, and if the tappets are not of the adjustable type the proper opening of the valves cannot be obtained. There are several ways of adding a piece of steel to the stem, but with the ordinary tools to hand as good a method as any is to carefully drill a small hole from 3-32nds to ⅛-in. diameter up the stem, then file a steel pin that can be driven in very tight. Drill and countersink a hole through a piece of steel strip and rivet on to the stem by the projecting bit of steel pin. Finally trim up with a file. Another way is to drill and tap a small hole up the stem and screw a small steel bolt in.

Used as a Spanner.

If the axle cap must be taken off and you have no spanner to fit or a wrench that opens wide enough, it may often be loosened by means of contriving a makeshift wrench out of a piece of cord and a bar. The cord is made into a noose and is tied so as to be of such a length as to conveniently embrace the axle cap by the hexagon portion. A piece of rod or tube is then passed through the loop that projects just sufficiently to get a good grip, using the nut that it is desired to undo as a fulcrum. The grip that can be obtained in this manner must be tried to be believed, and the harder the bar is pulled the tighter it draws the encircling noose. It is, in fact, on this principle that many of the pipe wrenches and automatic adjusting spanners are made. The same idea can be used to remove obstinate radiator caps by applying it in a similar manner as to an axle cap, or by twisting the end of the bar in the loop a tourniquet is obtained, which is useful to bind things tightly together. In place of cord, a piece of wire can be used.

If you don't see what you want, ask for it.

THE PAINT SHOP.

Suggestions For the Motor and For Profitable Work.

BY M. C. HILLICK.

It were an idle dream, no doubt, to picture ideal conditions for the average automobile paint shop, during the winter months at any rate. When the painting and repainting of automobiles becomes a more widely recognized business, better shop conditions will surely prevail. Until that time we must make the best of not a few exceedingly bad conditions. At this season it should be a chief duty of the auto painter to make his shop as tight and weather proof as possible, for after all has been done in this direction that can well be done, there will be found plenty of remaining defects. Weather strips around windows and doors are necessary and save coal bills. Battens, etc., where gone, or where loose and out of location, should be replaced. Windows should be looked after, and all glass cleaned.

The shop is in urgent need of all the light it can possibly command. Glass should be cleaned both sides. This directly facilitates operations and assists in the drying of paints and varnishes. Hygiene is served best where the shop is well lighted. Heat is another great agency which in putting the shop into winter condition should be practically and actively considered. Either good furnace or steam heat is to be preferred to the stove, and the latter should be employed only as a last resort. But there should be plenty of heat of some sort.

A cold, or partly cold, shop is an expensive shop, however modern other shop features may prove to be. No workman can do himself justice in a shop insufficiently heated. A great deal of time is always lost in the morning while waiting for the shop to warm up, and the maximum productive capacity of the employe is rarely ever reached in such quarters. Painting operations are invariably made longer and less certain in a shop only partially or not uniformly heated.

Among other preparatory work should be that of providing plenty of shelf room well up from the floor and in one of the assuredly warm corners of the shop. Varnishes do better if stored well up toward the ceiling on a shelf furnishing the material a clean, quiet and uniformly warm storage location. The winter stock of varnish should be in hand prior to the advent of cold weather, in order to avoid chilling of the varnish. Chilled varnish is a menace to clean and satisfactory varnishing. Here, too, on these high, warm shelves should be stored the japans and oils, and, in fact, the colors. A pigment maintained in a fairly warm condition mixes more readily, and, if anything, works over the surface smoother and flats out cleaner and more compact than one which, by virtue of frigid conditions, has experienced a separation of the drier from the atoms of pigment.

Brushes likewise are kept in a more workable condition in closed keepers stationed upon shelves well up from the floor. A bit of salt dropped into the water in which the paint and color brushes are stored will prevent freezing of the water should unexpected weather changes intervene.

Ventilation of the paint shop is a necessity the urgency of which should not be lost sight of. Pure, fresh air is of vital concern alike to the work and the workmen. It contributes health to the painter and insures speedier and more uniform drying of paints, colors and varnishes. And all of these, it almost goes without saying, are of supreme importance during the winter months—during all months, in fact.

Winter months are valuable from the standpoint of affording the painter an opportunity to make heavier painting repairs than time and the activities of the average auto owner will permit at other seasons. The burning off of surfaces, or the resurfacing with roughstuff over the old paint structure can now be performed and the work brought up with greater surety, if anything, than when the rush season is on.

Winter months furnish an opportunity, too, for the painter to get acquainted with the owners of horseless vehicles, and to canvass for new business. The automobile painting business cannot exist as a profitable enterprise except its owner gets abroad and advertises himself in a manner void of offense, but with telling effect along the line of picking up trade.

In these and in other ways the cold months of the year are, or should be, months of substantial development and assured profits.

STEERING METHODS

Extracts from an Address Before the A. M. C. M. A. Committee by C. E. Duryea.

To-day many a buyer hesitates because he fears the auto may not be safe.

He sees the many controlling devices and wonders what they are all for, and if he could ever learn them. He sees other men hiring experts to drive their machines and remaining themselves unable to drive, or if they do drive, they do it with great deliberation as though it was a difficult and perhaps risky feat. He does not see these vehicles driven by every member of the family as are horse vehicles, and so fears them because of some possible danger that he does not see. Is it any wonder that he does not buy when you offer him the goods?

Accidents result largely from failure to control, and controlling means are far from standard. Further, they are devices that can be made reasonably standard without much change and without vital change in most cases if the attention of the designer is called to the matter and he is given information as to what is best and what others are using.

How many designers have given the matter consideration from the standpoint of the user? Too often it is the case that the designer works up his gear system and lets the lever have the motion that comes handiest without any inquiry into the matter, on the ground that it is as easy for the user to use one set of movements as any other. This asumption is not true in the first place, and if it was it would not be a right conclusion, for users often wish to change to other vehicles and if the control is different the danger of accident becomes very great, because it is well known that in sudden emergencies men become rattled and the only thing they are fairly certain to do right are those they have done till they have become second nature. There are other actions which come naturally in such cases that we sometimes term psychologic.

Knowing these facts, it seems but the part of wisdom to, so far as we can conveniently, adopt those devices which are psychologic, and second, get, if possible, a form of control that is standard.

Natural things are easiest learned and often come without perceptible effort to learn. What are the natural control movements? It is natural to lean forward and push when you wish to get ahead. It is natural to extend the legs and throw the body back when it is desired to stop. These simple facts suggest foot brakes, forward movements of the gear lever for the forward speeds and backward movements for the reverse and emergency brake.

A second thought is division of labor. Most people are right-handed and use this hand to lift the hat, button

the clothes, take out a watch or handkerchief or adjust any little thing that may need attention while driving. At such times the left hand steers and sometimes throttles or handles the spark. It is certainly not wise to have the vehicle without control in these intervals even though they are short; and that the control may be as full as possible, it seems right that the left hand should have the steering and throttle in preference to less necessary features. This leaves the right hand for any one or more of the less necessary things, such as shifting gears, setting the emergency, adjusting the spark or the gasoline or those mentioned things which are so often done, but which are not vital to the control of the vehicle and safety as are the steering and throttle. It will be argued that most people are better able to steer and throttle with their right hand and that this hand should have these duties and leave the less important ones to the left hand; but this is fallacious. One cannot relearn the many uses of the right hand so easy as two new uses for the left can be learned. Any attempt to use the right for these important duties simply results in their neglect while the less important one is attended to, with the result that at some unexpected time the accident happens. Try buttoning your clothes with the left hand and you will see that the clothes are not made for left-handed people.

This division of labor should not be carried to an impractical extreme. A different operation for each limb is not in the line of quick and accurate results. One can concentrate the mind on one spot, and work fast there, but to try to do things at the same time in several spots, unless they are very simple movements, results in confusion and accident. On this account the vital movements had better be in one hand and that hand trained to the utmost. The less vital but complicated movements in the other hand, for the hands are much more deft than the feet; and the simplest operations only, such as pushing on the brake lever or clutch pedal, in the feet.

It may be thought wise to select that form most in use as the easiest one to adopt and advocate in the hope that the others will, as changes in their vehicles permit, come to this, but it seems wiser to me to suggest the form that seems most natural and safest and live in the hope that its good results will eventually lead to its adoption.

As I see the problem, it would be best to use the foot brake and clutch pedal, with the clutch under the right foot, as being the one most skillful. The left hand should have the steering and throttle always in charge. The other things should be given to the right hand. If there are variations from these considered, I favor forward or upward movement to increase power or advance spark and a backward or downward movement to decrease power or speed.

This should be the determining thought. What is the non-mechanical man, woman or child going to do in an emergency? Control methods that are simple and natural will be safe and increase sales.

How to Care for Goggles.

Goggles that are not likely to be used for some time should not be hung up on a convenient peg by the elastic webbing, as it will be found that when next worn they will not fit. This is due to the webbing stretching permanently to an extent which necessitates the clips being readjusted, with the result that the metal buckles come in contact with the back of the ear or the tender part just behind the eye. The cure is obviously new elastic webbing if the goggles are of an expensive pattern. If the goggles are of a cheaper variety it will be found less troublesome and more satisfactory to purchase a new and a better pair.

THERMIT IN THE REPAIR SHOP.

What It Will Do and How It Should be Used.

By JAMES F. HOBART, M. D.

The possibilities of thermit in automobile repairs has largely been overlooked, possibly through not being acquainted with the substance known as "thermit," which consists of a mixture, very finely powdered, of aluminum and iron oxide. The peculiar characteristic of this mixture is its property of burning, when once ignited at one point, and the supporting of its own combustion by oxygen released during the act of burning. Furthermore, the products of the combustion, as noted above, is not ash or slag altogether, but though three-fourths of the products of combustion (in volume) is slag, and superheated slag at that, the remaining one-fourth is superheated liquid steel of the finest quality, and about twice as hot as ordinary melted steel, the temperature of the melted thermit being about 5,400 degree Fahrenheit.

In thermit automobile repairs, it must be considered that any two pieces of metal, cast steel, soft steel or cast iron, may be so perfectly welded together in a very few minutes that the weld will be stronger than the adjacent metal, and can be filed, chipped or machined at will. The thermit is to be melted in a crucible placed above the proposed weld, and so rapid is the action of this substance that the stated heat of 5,400 degrees is developed in the crucible within thirty seconds after a match has been touched to the powdered thermit. With thermit the "autosmith" has at command means for welding anything from a bicycle spoke 1-16 inch in diameter, to the end of a cylinder or water jacket, or even to welding a crankshaft of any size or shape. A shaft 12 inches in diameter can be welded as readily as a 1 inch rod, excepting, of course, that more material will be required for the large work, and that more time and apparatus will be required to get the broken parts ready for the welding operation.

THERMIT-WELDING A CRANKSHAFT.

Suppose a crankshaft has broken and that it is to be welded by the use of thermit. If the fracture be a clean one, and the shaft has actually separated into two pieces, then cut, drill or grind away the ends of the parts, so that when they are placed in position there will be a clear space between them. The action of thermit welding is exactly the opposite of brass welding, or brazing, in which operation it is necessary that the parts to be united are brought into actual contact with each other—the closer the better will be the joint. A rivet, driven as closely as possible, and then upset and riveted to fill the hole, will be followed from one end to the other by the molten brass.

But in thermit welding the parts must be separated so there is space between them for the flow of liquid thermit. The reason for this is that the great heat of thermit is employed to bring the parts to be welded to such a temperature that the metal composing them is actually melted by the great heat of the thermit steel, which unites or amalgamates perfectly with the metals under repair. Thus, it is necessary that the broken parts be separated a fraction of an inch for the purpose stated. When the parts are merely cracked, and have not fallen asunder, it is usual to drill a row of holes along the crack, the holes almost touching each other, and only leaving occasional portions sufficient to hold the broken parts in position until they can be bolted fast to some sustaining arrangement which will keep them in place during the casting operation. Thus the thermit steel can circulate through the holes along the crack until the excess of heat in the thermit has melted down the corners and edges of the projecting portions left by the drill.

MAKING A WAX PATTERN.

With the parts securely bolted or otherwise fastened in place, the space between the parts is filled with yellow wax which is melted and poured, or is pressed into the space to be filled with steel. It is usual to mold an enlargement of the broken part where the thermit steel is to fill the gap, thus allowing the new steel to represent a band or collar around the mended article. By this, the welded portion is stronger than the rest of the article, because its section is larger. When the parts have been machined to size, of course the enlarged portion is impossible, but it is well to leave such an enlargement wherever possible. The wax filler or pattern is built over the ends of the broken parts from 1/8 inch to 2 inches, according to the size of the pieces being worked.

A FIRE-CLAY MOLD.

When the wax is in place, a mold of fire-clay is built over the wax, leaving two or three openings, one a gate for the pouring in of the thermit steel, another for a riser through which the steel backs up when the mold is full. This opening not only lets escape the gases from metal and from mold, but it supplies a head or vertical height of melted metal, the pressure of which serves to force the liquid metal into every portion of the mold. One more opening to the mold is necessary. This one must be at the bottom, and so arranged as to drain the mold of the wax when that material shall be melted out. This opening is also for the insertion of the nozzle of a very powerful gasoline torch which supplies so fierce a heat that the broken surfaces are brought to a red heat.

It is vitally necessary that the parts be brought to a red heat before the thermit steel is poured into the mold, for the reason that although the melted steel is twice as hot as the usual melted steel, it still will not be able to melt the edges of the fractured parts unless some heat is supplied in addition to that from the thermit steel. There is a certain loss of heat by conduction through the parts to be repaired, and heating to a red heat supplies the balance of heat necessary. The heating by means of the torch also heats the mold and dries it so thoroughly that there can be no blowing caused by moisture in the mold.

MELTING OUT THE WAX PATTERN.

The wax, which is quickly melted out by heat from the gasoline torch, must flow through the last opening described, which must therefore be inclined downward enough to drain the wax from the mold. Otherwise the opening in question could be made anywhere, or at any angle, or the gate or the riser could be used for the blow-torch blast. But by introducing the blast at the bottom of the mold and letting the hot current escape through the riser at the top of the mold, a natural course is taken by the hot blast, and there is no need of driving heat downward—something hard to do under some circumstances.

SETTING UP THE THERMIT CRUCIBLE.

While the heating of the mold has been going on, a crucible for the melting of the thermit has been set up directly over the gate. This crucible is an automatic affair, the melted metal being drawn directly downward from the bottom of the crucible by the knocking upward of a pin which supports the fire-proof bottom of the crucible. The charge of thermit necessary is 9½ ounces of the powder for each cubic inch of steel required, including the gates and risers. This quantity, together with some extra, so as to be sure to have enough, is ignited in the crucible after the blow-torch has heated the broken parts to a red heat, as determined by looking into the mold through the gate or the riser. When certain that the parts are red-hot, the thermit is ignited, the torch withdrawn and the lower opening closed with fire-clay, and the crucible is tapped and the superheated steel is allowed to flow directly into the mold until it is full.

Although the thermit burns readily when once started, it will not ignite by ordinary means, and an igniting powder is necessary, just as it is necessary to ignite dynamite by a special igniter. A little of the ignition powder, about 1 part to 100 parts of thermit, is placed on top of the thermit and is ignited by means of a storm match. If none of the strong-burning storm matches are to be had, a little bundle of parlor matches will serve to ignite the powder, but the storm matches (used by smokers to light a pipe in a gale of wind) are much more satisfactory.

APPLICATIONS OF THERMIT.

The applications of thermit repairs are almost numberless. The teeth broken from a gear may be replaced. The cracked cylinder or water jacket made as good as new and the broken crank will have no more terrors for the repair man, for with thermit he can almost "repair while you wait." Thermit will not repair a punctured tire, but it can be made to repair almost any bit of steel or iron about an automobile, and the cost is not as great as would be supposed. True, the steel supplied from thermit costs about $1.00 a pound, but that does not "cut much ice" in comparison with the time and expense of patterns, steel castings and the additional expense which frequently brings the cost of repairs much higher than the price a pound noted above.

For some work the thermit can be ignited in a crucible and after the reaction has taken place the slag should be poured off and the metal in the bottom of the crucible may be poured into a mold the same as when pouring ordinary metal in a foundry. But if the metal is to be used for repairing the parts must be heated as before described. If the attempt be made to repair without thoroughly heating the parts to a red heat there will be severe shrinkage strains set up in the work, and there may, and probably will, be bad blow-holes and other serious defects.

REPAIRING PLATES AND CASTINGS.

Holes in castings, or in sheets, particularly in thin metal, may be filled in either of the manners described above. In some cases where the strength of the resulting work is of little importance, the reaction may be made to take place directly upon the object. But in this case it is necessary to heat to a good red before the thermit is turned loose. By this method a little mold in the form of a cup is made over the portion to be filled with steel. The thermit is placed in the cup, on top of the heated metal, and ignited. The melting of the steel takes place in this operation just the same as it does when the thermit is melted in either of the crucibles described above. The possibility of not obtaining a solid weld or casting by this, the "cup" method, is on account of the possibility of small portions of the slag remaining in the hole when the steel flows in. Aside from this, the weld or casting will be as sound as made by either of the other methods.

POSSIBILITIES OF THERMIT.

Thermit should be investigated by the repair-man. It offers great possibilities. It will not cost very much to procure the necessary articles for testing and experimenting with thermit. A few pounds of that material and a few accessories will enable a man to work out just what can be done with it. Better say that it will enable a man to work out that which cannot be done, instead of what can be done, for the "can be done list will be a very long one and will "snow under" the "can'ts" in a very short time.

If the coil needs frequent adjusting, either the screw is too loose or the batteries are getting weak and should be replaced.

Occasionally go over the valves; it makes a wonderful difference to the even running of an engine.

Filling the Radiator.

A reader reports that he was afflicted with an instructive experience a few days ago. Up to the luncheon stop the car had run perfectly, but immediately upon the restart from the hotel it began to run badly, and presently the engine began to knock, a stop becoming imperative. Fortunately the sole attention the car had received was the filling up of the water tank, and this restricted the first field of inquiry. The driver luckily remembered that he had added about a gallon of water to the radiator with the engine stopped, and that when he took off the filler cap he had been able to notice that the level of the water was below the exposed ends of the vertical tubes. Hence he suspected an airlock in the water circulation, leading to absence of circulation, and consequently overheating. This was confirmed by the fact that the tank was cold, while the engine jackets were excessively hot. A drain tap was opened at the bottom of the pump, the filler cap removed and the engine started. In a minute or two the tank began to warm, so both orifices were closed, and the lost water was replaced by a gallon or so brought from a neighboring brook. Water should always be added to the radiator before the level has sunk low enough to expose the tops of any of the tubes; if the level be lower than this, the incoming water may imprison a pocket of air in one or other of the many narrow tubes in the system. One would expect the rush of water from the pump to force this pocket of air up into the space above the tubes in the radiator, but in practice it often fails to do so If replenishments be neglected until the tops of the tubes are uncovered, the safest plan is to open a drain tap placed at the lowest point of the circuit, and to continue pouring until a constant stream of water emerges from the tap, proving that the circulation is clear. It is also fairly safe to start up the engine, and trickle in the fresh water in a thin stream until there are evidences of a thorough circulation.

Oiling the Clutch.

One of the most commonly neglected parts of a car, so far as lubrication is concerned, is the clutch operating mechanism. In the case of some multiple disc clutches, which are enclosed in oil-tight cases, the oiling of the thrust collar and the lever which operates it is automatic, but in the case of many cone clutches, and, in fact, all that do not operate in an oil bath, the thrust collar and lever require oiling by hand. The duty of these parts is very severe, they being almost constantly in use in throwing in and out the clutch. Very frequent lubrication of the ball thrust bearing and of the end of the lever which actuates it is thus demanded. Not only so, but the bearing of the clutch pedal and the pins which secure together the clutch operating linkage should be frequently supplied with oil.

Absolute certainty in the lubrication of every bearing proportionate to the speed at which it runs means economy in oil—for one drop of oil delivered regularly to exactly the right spot will go further than twenty drops used irregularly.

One way to clean the glasses of sight-feed lubricators without dismounting is to take a red-hot poker and hold it near the glasses. This will melt the solidified oil on the sight glasses, and the drip of the oil will once more be visible. Another way is to have a piece of twisted wire connected on the end of the drip-nozzle inside the glass of the lubricator. The oil runs slowly down the spiral path, and is prevented from splashing over the glass and obscuring the view.

If you don't see what you want, ask for it.

Points About Tires.

The premature wearing of tires can sometimes be traced to the fact that the rear axle is out of true.

It costs about five cents a mile for tires for the ordinary car and up to twenty-five cents for racing cars.

The main thing to be sought by producers of substitutes for rubber for tires is to get tensile strength.

As a result of the crusade against steel-studded tires in England, one of the manufacturers has turned out an all rubber nonskid tube.

For a 5,430-mile run by E. W. Hill, of Bridgewater, England, the cost of fuel and tires was the same within two or three dollars, being about $85 for each.

Some experts will explain that the rubber in the tire is too much adulterated to give good service and the next ones will declare it is not adulterated enough.

Detaching and attaching a new tube is not half the work that inflating it often proves, but the driver who carries a compound pump, one that will inflate on both the up and down stroke, makes his work much easier.

A year ago a manufacturer invaded England with a tire that smelled of rubber instead of creosote and it had a beautiful look, but it lasted less than a year on the market because it could not be produced at a price that motorists could touch.

Solid tires may be possible if a new method of wheel attachment that is now being tried proves feasible, this system being one that gives a unique attachment of the steering lever to the axle, so that all road shocks are absorbed and the wheel movement made independent of the body of the car.

Air Pumps Need Attention.

Air pumps need careful attention. When used vigorously the barrels or cylinders soon become so hot that the bend cannot be placed upon them. This heat reduces the vaseline rapidly, until at last the leather washer is left practically dry and shrivelled and forms a very bad fit in the pump barrel. The pump then inhales far less air on the suction stroke, and on the expulsion stroke a large proportion of the air leaks back up past the washer, so that a huge number of strokes are required to give a rotundity to the tire, and it becomes absolutely impossible to pump the tires up to any high pressure. The washers should therefore receive attention proportionate to the use the pump is called upon to bear. New washers are never necessary if vaseline be frequently applied, but in emergencies an excellent washer may be cut from the tongue of an ordinary walking boot, treated with grease from the gear box. The dryness of these washers is responsible for the return of many a pressure gauge as faulty, for the buying of new pumps and for much futile labor.

A Standard Wheel Rim.

The automobile rim which the A. L. A. M. has adopted as a standard and which all car manufacturers will be urged to put out, differs in detail from most of the rims now on the market, although in general construction it follows certain principles which already have been approved through direct service in other devices of the sort. The main section comprises the base of rim proper and the inner flange, which is permanent. The outer flange is formed by a removable flange, or ring, which is reversible, while this, in turn, is held in place by means of a second and locking ring. The latter is broken at one point in its circumference, while a tongue formed on its lower side is arranged to interlock with a recess in the rim, by which it is secured from rotating about the latter and from springing out of position.

Two points of absolute novelty are to be found in the

arrangement. One is the formation of the removable ring in such a way that in either of its two possible positions it forms an exact counterpart of the opposite flange without any break in its continuity. The second is the use of a locking ring, which, instead of being of uniformly oval section, is recessed by the formation of a right-angled groove in its upper and inner side in such a way as to permit the side ring to overlap it. In this way the latter is provided with a very broad seating on the rim, while the contrivance also assists in the retention of the locking ring.

Grinding Gears.

Noisy gears are always due to some defect which may be remedied. When a bearing becomes worn it causes want of alignment by allowing the shaft to run out of parallel. Often the rear bearing of a gear-box wears more than the rest through the strains set up by the foot brake and the propeller shaft, with the result that the mesh of the pinions becomes inaccurate, and the teeth begin to grind. For silent running it is not only necessary that the teeth be accurately cut, but also the depth at which they shall mesh be adjusted to a nicety, therefore the correct boring of the recesses in the gear casing where the ball races fit is quite as important as the perfect formation of the teeth of the pinions themselves. Gears a shade too deeply in mesh will make a great complaint about it, only to be equalled by the hurly-burly they are capable of when the pitch lines do not coincide through their centers being too far apart. The importance of having shafts which carry pinions truly parallel with one another will be realized when it is pointed out that with parallel alignment and teeth properly in mesh, there is a contact on a line the width of the tooth of the pinion, and a true rolling motion if the gear is accurately cut, while if shafts are out of parallel the teeth only bear on a corner, and there is a destructive rubbing action.

Oil for Differential.

The differential is continuously at work when the car is being driven and, quite apart from the necessity to keep the large bevel wheel lubricated which takes the engine power off the propeller shaft, the differential pinions also require perfect lubrication to insure proper working. The differential gear-box, therefore, should not be starved of oil. Every differential case should have an overflow plug hole closed with a screw plug to indicate the proper level of the lubricant, and the novice should carefully test this before starting out until he has learned to judge how often to replenish from the dashboard pump—if there are no automatic leads supplied by pressure.

If the noise from the differential box when driving is louder than usual, the amount of the lubricant should be ascertained. If that is all right, the noise may be because the gear oil is too thin. Thick gear oil or too much—especially in the change-speed gear-box—leads to absorption of power, but there is a happy medium which yields the best results.

They Should Be Oiled.

It is a good plan to oil the spring links and bolts. The motion of the car while running causes some wear upon the top and bottom halves of the link bolts. Oil them occasionally as well as the eye at both ends of the spring, otherwise they are liable to wear to one-half their original diameter in the course of a season's use.

To prevent "burning" tires in rounding a corner, a good wide swing should be made, and the car should be under sufficient momentum to allow it to coast around with the clutch out.

The Valve Springs.

Weak spring valves prevent proper closing and they also effect correct timing. A good test for this complaint is to insert the end of a screw-driver blade between the convolutions of the spring and twist it slightly so as to increase the tension. If an improvement in the running is visible at once it may be taken for granted that the difficulty is due to the valves and in the particular valve under examination. Similarly a test for too strong a spring is merely to press lightly toward its fixed seat with the screw-driver blade, paying careful attention to the effect on the action of the motor.

The apparent requirement of a stronger spring, however, should not invariably be taken as proof positive that one is required. In case the valve stem happens to be bent out of line, or is too tight a fit for its guide, the sluggish action which this develops may result in a loss of activity on the part of the motor which the increased strength of the spring will apparently cure. Hence when replacing or strengthening a spring which seems to be overweak for its work, care should be taken to see that the stem runs smoothly and straight in its guide.

To Save the Tires.

Corners should always be turned at a slow speed; riding in the street car tracks causes tires to wear very rapidly; use the brakes judiciously—a car can be brought to a standstill just as quickly by a gradual application of the brake; if one or more wheels get out of alignment the tires will wear rapidly; care should be taken to keep oil from the tires; damp is very injurious to the canvas fabric upon which tires are constructed; rims should be examined occasionally and any roughness smoothed down; should an outer case be badly cut make a temporary repair with tire tape or tire sleeve and at the first opportunity have the cut vulcanized; don't use too much French chalk; buy good tubes; know how to make repairs, and, above all, know when a tire is properly inflated and see always that it is kept so.

Locating a Knock.

Sometimes a knock or a strange noise will be heard in the car and it is almost impossible to locate it. The sound will be as elusive as a weasel. When you are on one side of the car it will seem in one place, and when on another it will have moved somewhere else. In such a case get a flexible speaking tube, such as is used with phonographs. One end of such a tube can be held to the ear and the other moved about from point to point until the exact spot is found where the noise is loudest. Another aid is a light bar of iron, one end of which is pressed against the part where the knock is suspected and the other touched to the forehead or the teeth, when the sound can easily be located.

It is best to keep one's fingers away from the spark plugs or other terminals of the high-tension end of the ignition system while the engine is running. While the shock encountered may be harmless, yet it may be severe enough to unnerve the recipient for several minutes.

Use the brakes as little as possible, and drive on the throttle.

TROUBLE DEPARTMENT.

Under this head are questions and when possible, replies to them. Our readers will appreciate the importance to inquirers of furnishing the desired information promptly.

This department is intended to be a "trouble clearing house," and it will be esteemed a favor if our readers will add information to it from their own experience or knowledge.

An Overheating Engine.

From J. N. McCoy, M. D., Indiana.—Mr. A. H. Cobb inquires, in your September number, about an overheating Ford engine. I have driven a Ford for a year and a half and had the same trouble, but have solved the problem to my satisfaction, but in doing so I have acted in defiance of the instructions of the makers. If Mr. Cobb will take off his circulating pump he will find that it revolves with the convexity of the blades toward the water it is intended to propel. Let him remove the pin, take the pump off and turn it around so that it revolves with the concavity of the blades toward the water. I had any amount of trouble from overheating; I was advised that I had a bad mixture; that I had a dirty engine; that I had a weak spark; that I was running on a retarded spark; that my water pipes were clogged; that my pump was not working, and many other suggestions, all of which I heeded, looking to my pump, recharging my battery, had my engine gone over by an expert, but still I was forced to replenish my radiator every ten miles, or have it bait dry, and it never stopped overheating until I turned the pump over, since which time I have had no trouble. I made a run from Indianapolis to Vincennes, 144 miles, on a hot day, adding but a quart of water to my radiator on the entire run. One more suggestion: The pump should be fastened on the shaft by means of a steel cotter pin which fits the hole flush, so that it must be driven in, as, if any play is left, the pin will soon shear off and the pump no longer revolve.

Painting the Car.

From C. W. Perk, New York.—I wish to repaint my touring car dark red. Which is the better to use for a good permanent job, a paint mixed with varnish, or a dull paint of the color desired and finish with a varnish coat? I also wish to finish the top the same color as the car is, and would like to know what to use. The top is made of cravenette and is of a light tan color. Can it be painted, and if so with what kind of paint?

Reply.—You should apply flat color and finish with varnish coats. This is the only method by which to obtain a good appearing and a durable job. The top may be painted the same color as the body of the car. The color for the top, however, should be mixed strongly with raw linseed oil in order to give it the proper degree of elasticity. We would suggest that you would be likely to secure more satisfactory results if you were to turn the job over to an experienced carriage painter. At any rate, a varnish mixed paint will afford neither a satisfactory nor a permanent finish.

Size of an Engine.

From William Caryl, Iowa.—I wish to build a gasoline engine to drive a motor carriage suitable for one or two persons to go at a moderate speed. Can you tell me anything as to what should be the size of the engine and its speed for such purpose?

Reply—Possibly some of our readers with more experience may be able to give more correct information, but in our opinion an engine with a cylinder 4 inches in diameter and with a 5 inch stroke would answer, and the maximum speed should be about 500 revolutions per minute. Possibly we should add that you can buy an engine far cheaper and with far better results than you can build one, and it might be added also that you would have still better satisfaction if you were to purchase the entire outfit.

Chauffeur's Duties.

From Car Owner, Illinois.—Will you kindly tell me what are the duties of a chauffeur? At what hour should he be at the garage in the morning, and also what reasonable hour should he be expected to leave? When touring the car gets to the garage, say, at 5 or 6 p. m. Should the car be ready to start the next day at 9 a. m.? Is he expected to wash car after each day the car is taken out, and while touring is he to wash car after the day's run, say, 100 miles? When slight repairs to engine are necessary, should he be able to undertake these? While touring, what allowance should be made for board and lodging per diem? But in case of owner of car staying away from home at one place for several weeks, what extra allowance should be made to driver per week? I may add I do not expect my car to be out every day and all day, as otherwise a driver has no chance of keeping things in a satisfactory way, and while touring he must be allowed reasonable time to look over engine and car.

Reply.—A chauffeur is expected to care for and drive a car. He should be able to make slight repairs, and more extensive ones if the owner provides the necessary time and the tools and machinery. As to the number of hours he should work, they cannot be fixed, of course. When the car is not in use the chauffeur naturally has little to do, and during tours or at times when the car is in constant use he should not complain if he works hours enough to make up for his leisure when it is not in use. In a matter of this kind common sense is a far better guide than rules and regulations. If a chauffeur complains without reason, or refuses to work within reason, the better way is to let him go and hire another; if the car owner complains without reason or demands unreasonable service, the better way is for the chauffeur to leave, and let the car owner try to replace him.

Would Stop the Engine.

From a Chauffeur, New York—If an automobile is going at a speed which requires the entire power of the engine, and the dead load were to be doubled, what would be the effect upon the speed of the car, supposing it weighs 1,000 pounds and there is no change in the ratios of the driving gears.

Reply—In theory the power required varies as the product of the speed and the load; that is to say, if you double the speed you double the power required to propel it. With an engine running under the conditions you name, and without change in the gear, any additional load added to the car after the engine had reached its full power would stop the engine altogether.

Noisy Engines.

From C. L. A., Massachusetts.—Which makes the most noise, a water or an air-cooled engine?

Reply.—Probably the air-cooled engine is slightly more noisy, because the water jacket somewhat deadens sound, but otherwise there is no reason for any difference.

Cost of Running Steam Cars.

From Edmund Willey, Maryland—Will some of your readers give their experience with steam cars like the White or the Stanley? I would like to know how the cost of upkeep compares with that of gasoline cars.

ADVICE TO CHAUFFEURS.

These Don'ts Should Be Committed to Memory or Pasted in the Cap.

Don't race.
Don't graft.
Don't knock.
Don't be late.
Don't be dirty.
Don't experiment.
Don't get the big head.
Don't smoke in the car.
Don't let your car smoke.
Don't say, "That's good enough."
Don't use the wrong kind of oil.
Don't run with half-deflated tires.
Don't "borrow" tools from other cars.
Don't waste time doing unnecessary work.
Don't talk about what you hear when driving.
Don't forget to read your batteries once a week.
Don't try to see how close you can come to everything.
Don't run with muffler open. It's a sign you're an amateur.

Don't tear the car down unless you know what you're doing.

Don't be afraid to ask for information. No one knows it all.

Don't try to run the garage until you can run your own car.

Don't take all your friends riding when you are testing a car.

Don't think that you know more about the design than the manufacturer.

Don't say you are getting $150 a month when you're getting $90.

Don't force your engine when it's cold. Give the oil a chance to warm up.

Don't forget to let the clutch in gently. It's good driving—that's all.

Don't lie all over the cushions when you are waiting for your passengers.

Don't speak of the boss as "the old man" or "Smith." Better say "Mr. Smith."

Don't forget to change the oil in the crank case every 1,000 miles.

Don't curse the garage because you didn't see that your tools were in place.

Don't wait until time to start to find out if everything is filled O. K.

Don't forget the dealer is interested in your success and the success of the car.

Don't act like a kid around the garage or you'll be getting a kid's salary, perhaps.

Don't believe all the tales you hear about big wages and tips. Most of it's hot air.

Don't run without oil in the crank case and then say the engine bearings are no good.

Don't run with a late spark. It carbonizes your engine and is extravagant on gasoline.

Don't say some one has been monkeying with your car when you don't know what's the matter.

Don't try to see how quickly you can stop. It's hard on the car from the crank shaft to the tires.

Don't tell your employer the garage does not half clean the car when you didn't give them a chance.

Don't force the car up every hill at its limit to show what it can do. It will be expensive for the boss.

Don't make adjustments on the street unless absolutely necessary, which isn't often the case with a good car.

Don't put in a new battery every time the engine misses. It may be a dirty commutator or a dozen other things.

Don't forget that a high-class chauffeur is never out of a job, and has the best cars to drive, to say nothing of wages.

Don't forget to see that every nook and corner of the car is clean when it goes out. If it is the cleaner's business to do it, see that he does it.

Don't forget that the best chauffeur is the one who goes the most miles with the fewest number of revolutions of the engine, and consequently less wear and tear, less oil and less gasolene.

Rules for Drivers.

The following rules for drivers have been established by one of the garages of this city:

The first care of a driver is the safety of his passengers.

The second is the lubrication of his car.

CARE OF CAR.

1. All brakes must be kept properly adjusted.
2. All brakes must be tested immediately a car starts, before changing up gear.
3. The sight feed lubricator glasses are always to be clean and the hand pump working properly. All greasing and can oiling are not to be done oftener than necessary. The engine and steering gear must be oiled round at least once every fifty-mile run.

A driver whose car gives any trouble from neglected lubrication is liable to instant dismissal.

4. The back wheel brakes must be adjusted equally.
5. The pressure of tires must be tested daily and must not fall below 75 pounds per square inch.
6. Wheels must be kept tight on their seats.
7. Rubber water pipe connections and insulated wires must be inspected daily.
8. Accumulators must not be allowed to fall below 3.8 volts.
9. Paint and brass must be thoroughly clean when the car starts out for the day.
10. Lamps are to be kept trimmed and filled.
11. Tool boxes, etc., must be kept tidy.
12. The driver in whose charge a car is placed is responsible for its general efficiency, and must satisfy himself as to its condition before taking it over.

DRIVING.

13. A car must always be nursed and never be driven at full speed.
14. The clutch must be withdrawn in passing over new road material, and if the material extends far a low gear must be used.
15. Speed through towns and villages must not exceed ten miles an hour.
16. Drivers who exceed the legal limit of speed (20 miles an hour) do so at their own risk.
17. Great pains must be taken to start gently.
18. When a deliberate stop is made the brakes should never be used.
19. The horn must be used freely, especially on narrow and winding roads.

PERSONAL.

20. Drivers are to keep themselves clean, smart and properly shaved.
21. Smoking in a car is forbidden.
22. The utmost deference and civility is to be shown to passengers at all times.
23. Drivers must always have a copy of these rules in their possession.

Size of Tires.

In purchasing a second-hand car, either for use or to sell again, it is well to consider the tires carefully, and to figure on substituting larger tires if those used are under suspicion. A safe rule is to have the tires ½-inch in section for each 100 pounds of total load, including passengers and supplies. For example, a 3½-inch tire should not carry over 700 pounds maximum. The tire makers have brought out two odd sizes of tires especially to take the place of smaller sizes without change of rim. These are the 31 by 4 and the 33 by 4-inch sizes. The 31 by 4 size will go on a 30 by 3½-inch rim, and the 33 by 4 on a 32 by 3½-inch rim, without changing the rim.

A Standard Spark Plug.

The Association of Licensed Automobile Manufacturers has adopted a standard spark plug which has a 7/8 diameter, a straight thread, 18 pitch, and the design dimensions shown in the accompanying drawing and specifications: A, one and one-eighth inch; B, seven-eighth inch; C, one-eighth inch; D, seven-eighth inch; E, not less than one-half inch; F, not more than one-eighth inch; H, three-quarters inch.

A Good Record.

From Inglis & Son, Nebraska.—Your publication is just what we want in our business. Possibly it may interest your readers to know that two of our citizens went to the factory of the Franklin Automobile Company, in Syracuse, N. Y., and bought cars and made the run from that city here and it did not cost a penny for repairs. I call that a good record.

Where He Gets Pointers.

From C. B. Shirley, Massachusetts.—I think your publication the best "auto" paper published. I have in times past got lots of pointers from it.

Short and Pointed.

From J. M. Moore, M. D., Ohio.—I consider three numbers worth a dollar. You have the right idea. Your articles are short and to the point.

If you find what you want here, please tell your friends about it.

Rear Lamps Going Out.

On several occasions cars have been stopped at night for no other reason than that the tail lamp kept going out. Observation has led us to believe that many a sound tail lamp is condemned by owners simply because the flame is habitually turned up too high. The owner further knows that the wick is gradually consumed, and makes allowance for its diminution by turning it up too high at starting; he further imagines a lofty flame is less likely to blow out. No lamps are so made that they will not smoke, and the consequence of turning these lamps up too high is that the lamp body soon becomes full of foul gases, which act upon the flame exactly in the fashion of an ordinary candle extinguisher. Our advice, therefore, is never to condemn or scrap a tail lamp until a very low flame has been experimented with. One lamp choked with smoke if turned up and blew out if left burning low; but the enlargement of the air holes at the base permitted the wick to be turned up without smoking, and this higher flame was too sturdy to be blown out, so that the lamp was afterwards perfectly satisfactory.

Starting a Truck.

Start a truck in a straight line before turning the steering wheel; because by turning front wheels when truck is standing still a heavy and unnecessary strain is placed on the fastening device of motor tires of any make. Start gradually; avoid jerky motions under all circumstances. Do not persist in running vehicles along street car rails. This grinds down the edge of the tire.

Carburetter Popping.

This means a weak mixture, or not enough gasoline for the amount of air. Explosions in the muffler indicate that the cylinders are firing irregularly and the unfired charges pass through the exhaust pipe into the muffler, being ignited there by the heat of the next explosion. A weak battery is sometimes also the cause of this.

A frequent cause of leakage in tires is the loosening of the nut that tightens the metal valve stem into the inner tube.

Nine thousand barrels of oil were used to lay the dust in the famous old Monmouth racetrack, in New Jersey, just prior to a day's automobile racing.

VACUUM MOBILOIL.—Have you ever looked into the matter of "Mobiloil" advertised in each issue of the AUTOMOBILE DEALER AND REPAIRER by the Vacuum Oil Company, of Rochester, N. Y.? If you have not, it may be worth your while to do so. Write for their Mobiloil Booklet. It will not cost you anything, and the information derived from it may be worth a whole lot to you. Consult their advertisement, and in writing, please mention this magazine.

THE AUTO CONTACT BATTERY BOX.

Illustrated herewith is the Auto-Contact Battery Box for which patents are pending in the United States and foreign countries. The claims made for it, which seem to be correct, are that it requires no wires, no tools, no bother, no skill, and uses any standard dry cell. The old cells can be removed and new ones put in, with no danger of wrong connections, in twenty seconds. All connections are automatically made by the mere closing of the lid, by means of heavy phosphor bronze spring contacts. Any standard dry cell may be used, and trouble with loose and broken contacts are done away with. All you have to do to put in new batteries is to take out the old ones and slip in the new ones, then close the lid. Nothing could be more simple.

If you want to test your cells you do not have to detach each cell, test it and connect up again. You open the lid and test them without any wires or contacts in the way. All cells are instantly and automatically connected by the mere closing of the lid. All connections are instantly broken by opening the lid and all batteries fully exposed for inspection or test.

By opening switch on the inside of the cover, and then locking the box, it is impossible to start the motor, thus absolutely preventing unscrupulous persons using your car. For further information, address A. Hall Berry, 97 Warren street, New York.

Classified Buyers' Guide.

CLIPPER SHARPENER.—In this issue will be found the announcement of John Van Benschoten, 14 Catharine street, Poughkeepsie, N. Y., who manufactures a Clipper Sharpener and Surface Grinder, which, he says, will be found profitable in every repair shop. Send for descriptive circular, and then you can tell yourself whether you think it will be profitable or not. Mention the AUTOMOBILE DEALER AND REPAIRER.

Index to Advertisers.

A NEW NON-SKID TIRE.—The Firestone Tire and Rubber Company, of Akron, Ohio, have just placed on the market a remarkable non-skid tire. It is called the "Firestone Non-Skid," which name is placed in raised letters around the body of the outer tire casing. Thus the name itself prevents the car from skidding. Many experienced persons who have seen this tire in use declare that it is the nearest approach to a perfect non-skid tire that has ever been invented. It has been thoroughly tried out and has given excellent satisfaction. Interested readers should write for full information, not forgetting to mention the AUTOMOBILE DEALER AND REPAIRER.

FRENCH AUTO OILS.—In this issue will be found the announcement of the Marshall Oil Company, of Marshalltown, Iowa, distributors of the French Auto Oils. These are said to be the only oils made from "Tiona," the only premium crude produced. No acid, alkali or other chemical is used in making these oils. They are filtered through animal charcoal and Fuller's earth by a new and improved method, thus removing any trace of grit or any other foreign substance. This company wants agents everywhere to handle these oils. In writing to them, mention the AUTOMOBILE DEALER AND REPAIRER.

Automobile Dealer and Repairer

A PRACTICAL JOURNAL EXCLUSIVELY FOR THESE INTERESTS.

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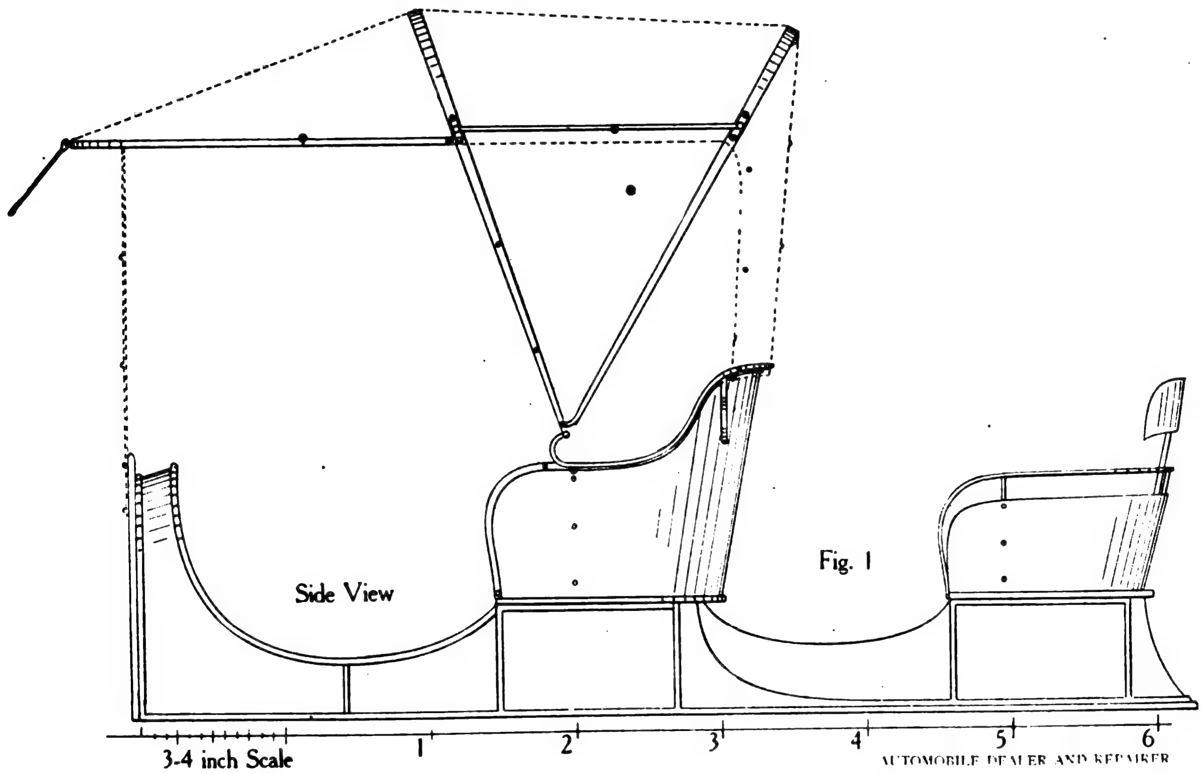
RUNABOUT TOPS.

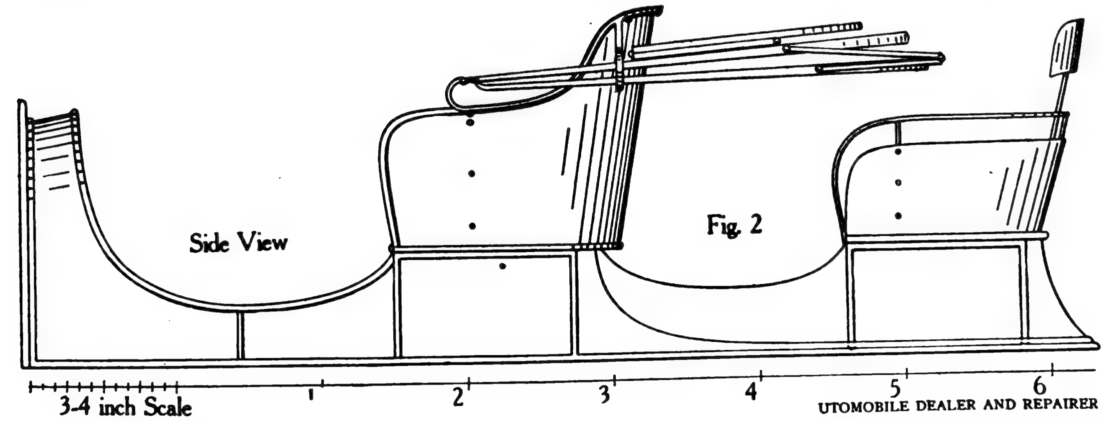
Some New and Practical Ideas in Their Construction Making Them More Convenient and Sightly.

BY REPAIR MAN.

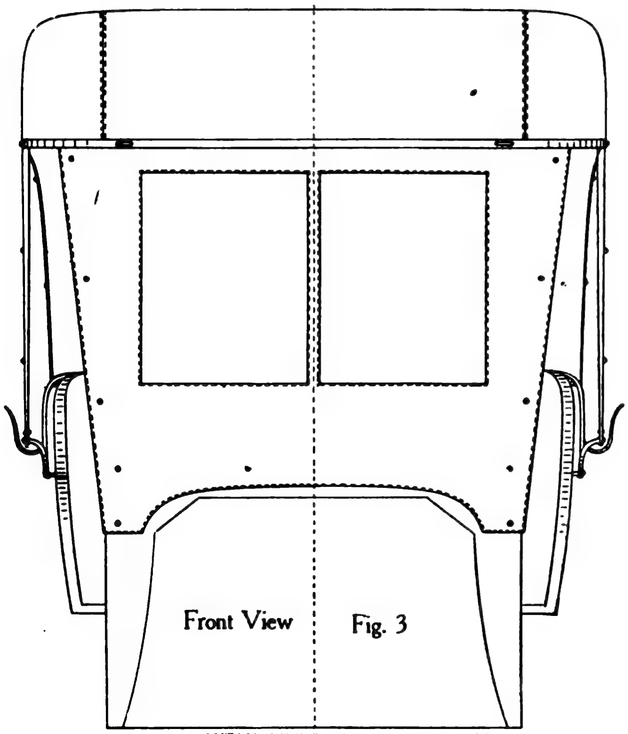
Auto repairers have a great deal to contend with in changing auto bodies and in top work. If they were free to carry out their own ideas, which they have acquired in practice, the repair business would be more pleasant; but changing, and with every change thinking out new ideas, and putting them into practice so that they are satisfactory to the repairer and the client is a brain-racking affair.



For instance, we have made a great many auto runabout tops, with one bow square up from the slat-iron, the rear bow slanting as usual and the front bow in a horizontal direction, showing, when the top is up, two bows only, while in fact there are three bows. These tops have been very satisfactory to most auto owners and riders, as they are so very handy to get in and out of, and are most serviceable if built right. But one of my clients did not want it. He told me nearly every one has a top of this style, and when they drop the top there is too much trouble to hitch the horizontal front bow to the center bow. The customer's idea was that the vertical bow



should incline forward to be in harmony with the rear bow, as the appearance of a vertical bow when the front bow has been removed is not pleasing, and the front horizontal bow should be stationary, so the top can be thrown without hitching it to the center bow. He also asked:



"What are the top joints good for? A top of this kind can be built without them."

Suggestions of this kind from a man who had been hardly in an auto repair shop set the repair man thinking, and he started to work out the problem which had been suggested to him, and the side view as shown in Fig. 1 was the result.

The car body was one with a metal front and nine inches deep, one seat for two in front and one narrow seat in the rear. The body under the front seat was square up and down, while in the rear the body under the seat board was a great deal narrower than across the bottom. Both seats were well shaped. The curves were well rounded on both seats and a well proportioned top would improve the entire car. The body was exceedingly long and only nine inches deep. The repairer decided that on such a body a four feet six inches long top would not do, and five feet long would be more in proportion. To replace the horizontal bow an iron bow was put in its place, with a buckle joint on each side, similar to a top joint, seven-eighths inch deep and one-half inch thick at the joints, while toward the front three-sixteenths inch by seven-eighth inch was sufficient. The front had nearly the same inclination forward, but the rear was inclined backward. This front joint was considered far better than the horizontal bow, because when the top is a few years old the top leather will shrink, and then it is difficult to remove the rear end from the sockets. In this draft when the joint is closed the leather is bound to stretch if the joints are strong enough to withstand the strain.

The repairer had an idea that the two bows should be forced apart to make a smooth top, but we will show later that such a top can be built without any top joints. The front storm curtain, instead of being buttoned on the inside edge of the horizontal front bow, is strapped to a one-quarter-inch round iron cross rod, and when rolled up it is directly under the top leather and level with the under surface of the joint. The straps and buckles are joined to the top leather. If the storm curtain needs removing it is removed from the cross rod and unbuttoned at the lower end.

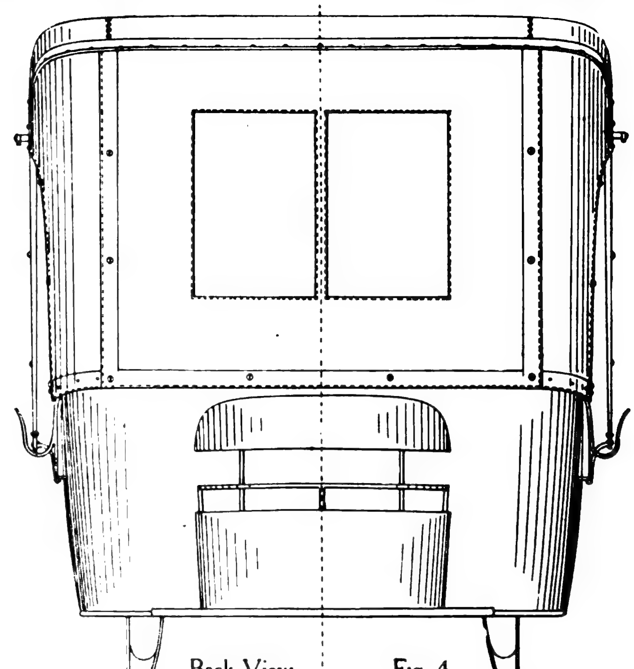
With Fig. 2 we illustrate the bows and the two joints folded and the rear bow resting on the bow-rest, which is welded to the shifting rail. The shifting rail to look well should have the same curve as the seat rail. Both should be level, but the rail should be one inch outside of the seat. When the top is folded the front joints are forced downward and the short ends rest against the bow and the long end against the joint.

By looking carefully at Fig. 1 and Fig. 2 it can be noticed that this is a great improvement in runabout top construction and worthy of imitation.

The front view, Fig. 3, shows to advantage the shifting rail, the gooseneck and the bow rest. It shows the space between the seat and the shifting rail, how the gooseneck should be curved and the shape of the bow rest. Note the storm curtain. At the lower end it is a trifle wider than the dash; on top it is forty-two inches wide, and both sides are cut straight. There are two windows fourteen inches across each and seventeen inches deep. The strip at the center is one and three-quarters inches wide. The celluloid is one width across and sewed to one and three-quarters inch wide goods.

The storm front is buttoned to the dash with six buttons, as shown.

The back view, Fig. 4, shows to advantage the rear of the body and rear seat. The rear of the body is concave, while the front is square; consequently the rear side panels start from the curved line, which is square and gradually concave toward the rear end, making a surprisingly good finish. The small rear seat is built directly

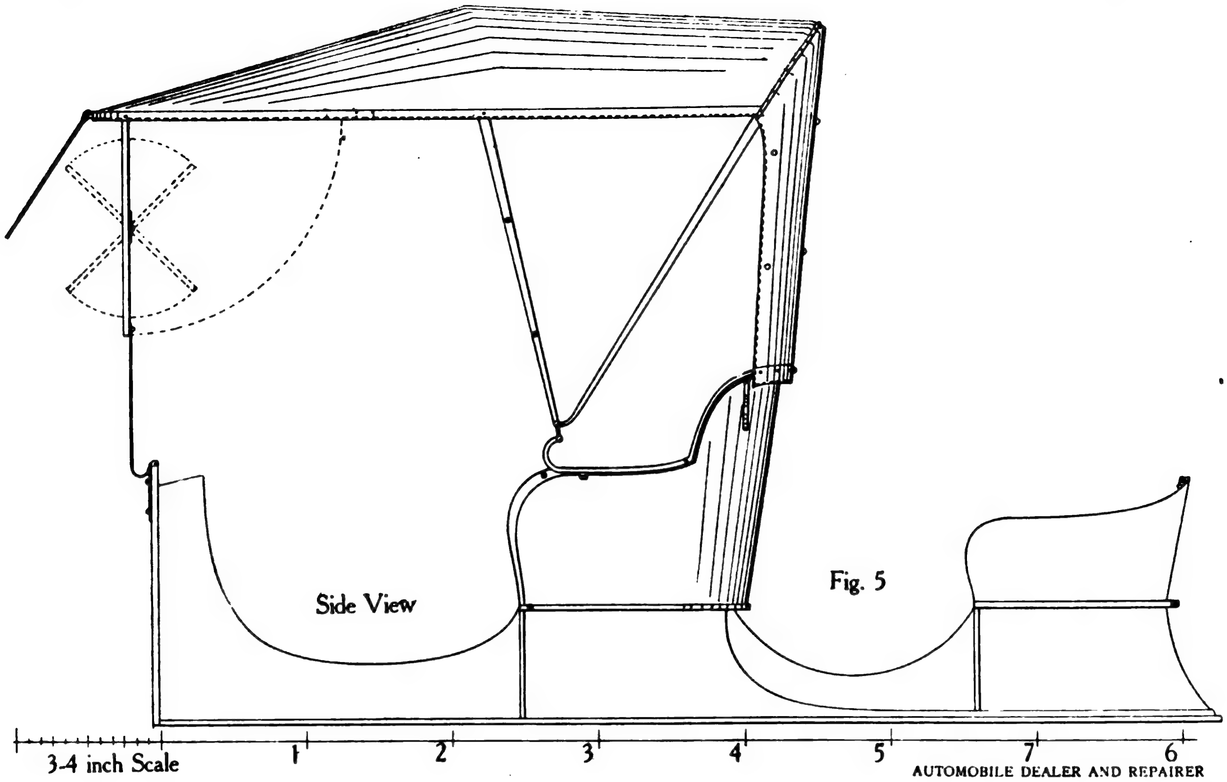


on the board and is fastened to it. Some of these seats have no rail or lazy back.

The back curtain is thirty-six inches wide for a forty-eight-inch wide top and is buttoned with four buttons to the shifting rail, while on the upper edge it is tacked to the rear of bow. There is also a celluloid window in this curtain which is fifteen inches deep and twenty-one inches across, with an up and down strip in the center. The cur-

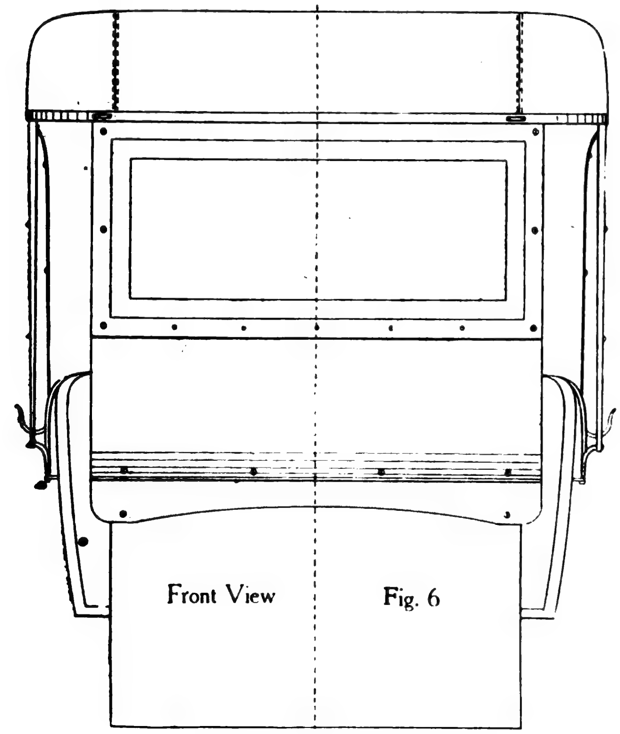
tain is one width top and bottom, consequently the side stays are square up and down and shaped as shown on the side view.

With Fig. 5 we show a more improved top and a far



AUTOMOBILE DEALER AND REPAIRER

more convenient storm front. On this top the gooseneck is moved further front, making the distance between the slat-iron center and the bow rest two inches longer. Also



AUTOMOBILE DEALER AND REPAIRER

the top edge of the front bow is in the center, making both parts the same length. Otherwise both tops are alike.

There is a front frame eighteen inches deep and thirty-seven inches long, but it can be made longer. It is hinged or strapped to the cross rod previously mentioned. In this frame is fitted another having a glass in it, same as the other fronts. This frame is fastened in the center and moves as shown by dotted lines on Fig. 5. The main frame is loose and swings around the rod, as shown by the circular dotted lines.

The lower part is closed with flexible material, the same width as the main frame, and must be loose so as to avoid partly the air pressure. The upper part of this material is fastened stationary to the frame and the lower part is buttoned to the dashboard. If the top is let down the flexible material is unbuttoned from the dashboard and folded with the top. When calculations are made for such a top the front knuckle joint must be made so that the frame drops beyond the back of the seat, and should not drop on the top edge of the seat. In all cases the knuckle joint can be placed to throw the frame either toward the front or the rear.

Fig. 6 shows the front view and both frames to advantage. In case there are side curtains they can be buttoned to the main frame, to the flexible material and the dashboard. A wind shield of this kind looks far better than those made for runabouts at present.

Acetylene Generators.

When traveling in cold and frosty weather there is much less likelihood of the water in the acetylene generator freezing if the generator itself is enclosed than if it was exposed to the dry, cold air. The box should be large enough to enable the generator to be packed with cloths, so as to prevent any tendency to rattle and dispel all chances of the water freezing. Besides, a car presents a much neater and finished appearance with the generator stowed away in a box finished to match the car. Of course, these remarks do not apply to those cases where the makers forbid boxing the generator.

If you find what you want here, please tell your friends about it.

THE DEALER

A NEW ENGINE.

Valveless, Silent, Powerful and of Uncommonly Wide Range.

If reports are true, the Chicago man named Charles Y. Knight, who not long ago invented a valveless engine, has done something that is likely to add more to automobiling than any invention for several years. The well-known Daimler Company of England, after a year of experimenting in its own shops and laboratories, has put the great machinery of its plant of 3,500 employes into operation to produce the valveless, silent and flexible Chicago engine for thousands of cars and taxicabs. There are contracts calling for 2,000 of the latter alone on the Daimler books.

But the good fortune of the Chicago "engineering amateur," as the experts of Great Britain are calling him, did not stop with interesting the Daimler people. Mr. Knight demonstrated the merit of his motor in such an obvious manner that other big interests decided to abandon the poppet valve motor and adopt the radical sleeve of the Knight motor.

The Daimlers have the exclusive right for Great Britain and they will pay a huge sum in royalty each year fixed on horse power and terms accepted without quibble when the year of experimenting at the Coventry factory was ended.

The Panhard et Levasseur Company of France has paid a large sum for the privilege of exclusive exploitation of the valveless engine in France.

The makers of the Mercedes cars in Germany are about to close the contracts for the exclusive use of the engine in Germany and Austria; the De Luca-Daimler establishment has taken the rights for Italy; the Minerva firm has taken the rights for Belgium and three big United States makers are abroad trying to close for the right for this country.

Mr. Knight says he scarcely feels equal to the task of figuring what the interests might become when the field of stationary engine motors was worked. In all probability the Knight engine, as improved and turned out by the Daimler company, will be found in the 1910 model.

"We have demonstrated absolute silence," was one point made by Mr. Knight, and he distinguished the silence of the motor from the so-called silence of the poppet-valve type. Smoothness of operation was another point exploited before the club.

Greater flexibility than the other motors is another claim he set forth—flexibility approaching so closely that of steam as to leave nothing to be desired. Reliability in that the motor is absolutely fool proof was a telling point in his address.

Outside of the nuts, bolts and cotter pins, fully one-fourth of the number of parts required to assemble a poppet valve motor comprise the Knight motor system. Tests have shown greater fuel efficiency and greater working endurance for the valveless motor.

One of the 114 by 140 millimeter motors under test in a great continental factory has been under full load on an electric brake nine hours a day for more than fifty days, at speeds ranging from 800 to 1,650 revolutions per minute, and it is as steady under power as a clock.

Mr. Knight made the claim of greater power and speed. The Daimler company has settled on a compression which gives slightly over 57 horse power at 1,200 for the 38 horse power on a R. A. C. formula. This motor is capable of being accelerated up to 2,500 revolutions or being throttled to less than 150.

A big man in the automobile world in England, after seeing a Knight motor (R. A. C., 38 horse power rating) on the bench at the Daimler works, running at 2,200 revolutions a minute and developing more than 80 horse power, and after putting his ear to the motor and distinguishing no tap, remarked to Mr. Knight: "The quietest thing that ever came from America."

Road tests have been made in England to the satisfaction of the experts. One of the latter says of the "patented property, which consists of a movable cylinder, otherwise the inner sleeve, telescoped over a fixed head," the tersest description of an essential feature of the motor, that:

"At last we have engine silence without loss of compression, while the absence of sharp, unmachined corners and of any uncooled surfaces, such as valve heads or valve plugs, makes possible high compression without pre-ignition, thereby affording smooth running and the development of the due power at every engine speed within the uncommonly wide range of the machine."

Quite a Load.

It is always gratifying to note the success of an enterprise that has been obliged to meet the opposition of the conservative wiseacres. The Cartercar was practically the pioneer in the friction drive principle, and although any one who studied into it could not help hoping that an idea so simple and easily controlled would be successful, he

was usually "from Missouri and wanted to be shown." But now the showing and the proving are established, and, like the sinner in revival times, those who "came to scoff have remained," if not to pray at least to admire. The Cartercar is now established as one of the most reliable and attractive automobiles in the market. The illustration shows a Cartercar recently carrying fourteen men from the Dennison Hotel, Indianapolis, to the fair grounds in that city, a distance of six miles.

FOREIGN OR AMERICAN?

Two Opinions as to the Respective Merits of Materials.

Here is a comparison between American and foreign cars, by Mr. Hollander, of the Fiat car:

"America, with its tendency to consolidation in all its large manufacturing industries, has formed such gigantic corporations that we see in the steel industry to-day concerns with huge capital seeking only the largest orders. Our large steel companies, accustomed as they are to receiving orders for several hundred thousand tons of steel rails or armor plate, disdain an order for fifty or a hundred tons of specially alloyed steel for the use of any automobile factory, as it would not pay them to run one of their enormous plants for a short period of time for the production of so small an order. That such alloys cannot be made in America is not claimed, but that these huge corporations are unwilling to momentarily stop the production of important orders for the purpose of running through these small, and to a certain extent experimental, ones, is plainly evident.

"It was early recognized that these unusual conditions called for special materials, and the greatest metallurgists in Europe and the foremost producers of steel immediately applied themselves to the manufacture of new alloys suitable to the new requirements. Furthermore, the steel plants in Europe were willing and anxious, through a desire to foster and encourage the new industry in their respective countries, to produce these materials in however small quantities the automobile builder may have demanded.

"In spite of all statements to the contrary, it is undeniable that Europe still is building its motor cars of materials far superior to anything used in this country, with the possible exception of cars using materials of foreign origin. Our manufacturers here may deny this statement in public, but there is not one of them who is not fully aware of it himself, and who does not recognize it when discussing the question with his own coworkers and confidants."

Here is a comparison made by Alfred Reeves, of the A. M. C. M. A.:

"Since the automobile came into popular favor in this country, it has been a case of the public feeling that the foreign machine was in every way superior to that made at home. In the past an automobile stable was not considered complete unless it contained one or more foreign cars. Now it is entirely different. The great majority of Americans have been convinced that it is foolish waste of money to import a foreign machine when it is possible to secure a better one in this country. Much time is saved in purchasing an American car, while the matter of duty is no little consideration.

"There probably is no better illustration of the superiority of the American car than the New York to Paris race conducted by the New York "Times." The main object of the contest, which, by the way, originated abroad, might have been to so thoroughly demonstrate to the American public that the foreign car was superior to the American on American roads and under American touring conditions that more foreign cars wuold be shipped into this country. The victory of the Thomas car in this greatest of all races thoroughly demonstrates to the most exacting that the American car is better than the pick of foreign machines. A new era opens for the American automobile manufacturer, with the world as his market."

As to the comparative merits of foreign and American cars, judging from the foregoing opinions, it must be admitted that the foreigner gives the stronger argument, for in the 'round-the-world trip, cited by Mr. Reeves, the result depended more upon the drivers than upon cars.

It is fair to say, however, that when the 45 per cent. duty is added to the foreign car coming into this country, the purchaser can get far better value by securing the home product.

CARS FOR PHYSICIANS.

What They Think of Their Use in Their Professional Work.

The Journal of the American Medical Association has secured from a large number of physicians their opinions and experiences in using automobiles in place of horses, and the following from among the more concise views will be read with interest:

Dr. J. E. P. Holland, Bloomington, Ind.—I certainly could not do without my car.

Dr. Ira M. Comstock, New York Mills, N. Y.—I believe that the automobile is a necessity to the general practitioner.

Dr. W. K. Prichard, Cloverdale, Ind.—With a machine, time—one of the most valuable things a physician has—is conserved.

Dr. D. W. Evans, Scranton, Pa.—1. Too high prices. 2. Too much tire trouble. 3. Too much robbery by repair men. 4. Too small power wheels. 5. Too little clearance. 6. Too much speed.

Dr. Henry E. Tuley, Louisville, Ky.—I have found it entirely impossible to use my cars in the winter for health reasons, but during the spring and summer use it continuously with great satisfaction.

Dr. E. S. Winslow, Orange, Mass.—My car is inexpensive to run and is handled very easily. It has all the speed that is necessary, is a good hill-climber and rides as easily as any carriage. It is adapted for both summer and winter use.

Dr. John Specht, Superior, Wis.—Last year a motor cycle was my hobby. But I found that for a physician who wishes to be well dressed and have clean clothing a motor cycle is not practical. I intend now to get a single-cylinder gasoline motor car, with a good top and storm front and apron, and will be able to ride in all kinds of weather.

Dr. G. F. Reineke, New Ulm, Minn.—My car, a 10-horse power single cylinder runabout, always goes. It is more reliable than a team if the roads are fair. I do all my own adjusting and most of my repairs. My expenses, except for tires and repairs, amount to about $25.

Dr. Louis de M. Blocker, Pensacola, Fla.—On our sandy Florida roads for nine months, my machine has had as rough treatment as any machine could get in running over rough roads, washed out by log carts, running into stumps, etc., and to-day is in good shape. The cost of maintenance has been small; my horse costs three times as much.

Dr. R. R. Campbell, Chicago—Now that the automobile has become a necessity with the busy practitioner, the two all-important questions are what to buy and where to buy. I would answer the first question by the simple statement, a first-class four-cylinder machine.

Dr. M. D. Westley, Cooperstown, N. D.—For three years I have made my calls in a runabout and find it practical and economical. I was delayed on the road but twice last season, by a nail puncture and by water freezing in the carbureter. During cold weather I use 30 to 40 per cent. wood naphtha in water for cooling.

Dr. E. F. Cooke, Houston, Texas—My little old auto is running to-day as sweetly as ever, although it is about five years old, but it has not sufficient horse-power to carry a top well, and so in bad weather I have to use a

horse and buggy. The great expense of operating a machine nowadays is in the tire.

Dr. E. T. Fields, Ensley, Ala.—I have owned two cars but I have never given up my horses and buggy and would advise anyone—especially those who have more or less muddy country roads to run on—to not think of giving up horse and buggy entirely. It is mighty nice to have both.

Dr. H. W. Chapman, White Hall, Ill.—On good roads the automobile is far superior to the horse. On bad roads the horse is still in the lead and most satisfactory. Drive at a speed that shows you have some regard for others if not for yourself, and a properly designed and constructed car will do the work of three horses at the cost of one.

Dr. Marion M. Hull, Atlanta, Ga.—Since July 10, 1907, I have driven my car over 3,900 miles on professional calls, with the exception of possibly 150 miles on purely pleasure drives; have not been without the use of it a single day; and the total cost of maintenance, including repairs has been under $200.

Dr. O. C. Breitenbach, Escanaba, Mich.—Motoring under difficulties in this northern country, a one-cylinder machine served me very well at first. After one year's service the multiple cylinder machine stimulated vain desires, and I began to use a two-cylinder touring car. I have come to the conclusion that a certain four-cylinder runabout, because of its light weight and economy in maintenance, is the ideal machine for the practitioner.

Dr. W. C. Clarke, Cairo, Ill.—Last October I wound up my automobile experience at a decided loss—the friendship of the one to whom I sold the machine. Since that time I have increased in weight and general appearance. The transition from mechanic, electrician and general roustabout back to M. D. was very pleasing, indeed. I have more money now, do not beat my wife or grocery bills, ride in a comfortable buggy drawn by an old plug always good for a return trip, and am entirely satisfied over my complete and permanent recovery.

Dr. Max Henning, Memphis, Tenn.—My car has cost me $2,000 counting extras, with monthly expenses running from $25 to $50, besides keeping a horse and buggy for bad weather and when the machine is laid up for repairs. Since the middle of August I have gone over 3,500 miles, using 380 gallons of gasoline, costing $69.80.

Dr. S. B. Dickinson, Watertown, S. D.—My 6 horsepower runabout has now been doing practically all my work for nearly five years, both summer and winter, and will run through soft snow or mud very satisfactorily, having just as much power as four years ago. I have done most of the repairing and adjusting, which has been very little, during the past year. I do not expect to revert to the use of the horse-drawn vehicle except when the roads are very bad. Were I to buy a machine to-day I would want one with, briefly, the following points: 1. wheels 36 to 40 inches in diameter; 2. solid tires; 3. wheel base not less than 70 inches; 4. chain drive to both rear wheels; 5. water cooled; 6. friction drive; 7. engine in center or toward rear, and 8. at least 12 horse-power.

Dr. G. T. McCullough, Missoula, Mont.—In 1907 I ran over 3,000 miles for $365.40, or one dollar a day. In this expense account were four new tires, two new front springs, a new transmission frame (broken by losing out a bolt), gasoline, lubricating oil, a new carburetor and all minor repairs, besides one complete overhauling with grinding of valves, dry cells and charging storage battery. My car is kept at home, and ready for use in a half-minute at any hour. I find the auto a great saver of time and would not be without one, yet I do not use it exclusively, as there are times in mud and snow that the buggy or cutter is more desirable.

SELLING CARS.

How Best to Treat Prospective Buyers of Cars.

The automobile salesman should have first a thorough knowledge of the product he is selling. Second, he should be absolutely truthful in statements. Third, he should possess adaptiveness to the buyer's moods. A wealthy man desired to secure for himself the best automobile made. While the difficulties of solving that important question were great, still with a little proper instruction he could have secured any one among half a dozen of the high priced grades which would have filled his wants and satisfied him. After going around, however, he met with so much talk about other makes of machines as to convince him that all were bad and faulty in construction, and in the quality of material used. The result was that he finally bought a machine of medium price and quality, remarking that he could see no difference in the appearance and finish, that the features of this car seemed to be much like those of the higher price ones that he examined, and so far as the brief demonstration in the parks and city streets was concerned, it was quite as satisfactory as that of any of the expensive cars.

Value is a relative term applied to automobiles as it is to clothing, houses, watches or any other commodity. Full explanation as to what difference in construction could add $1,500 in value to what in its resplendent red paint and shiny brass looks like an imposing car would take up too much space. As there are differences in construction between one-dollar, ten-dollar, fifty-dollar and five-hundred-dollar watches, so there are differences in the various grades of motor cars offered for sale.

Take the motor construction of a high class car. In the first place, care and selection of material throughout is a much more complex question than many would suppose. The generic term "steel" may cover a multitude of sins. Their grades from one to the other are as wide as the poles.

In the first class motor throughout, no less than two grades of alloy steels will be used in the motor, and no fewer than four to five different heat treatments will be given to these differing grades of alloy steels, in order that they may best meet the service to which they apply. In the matter of cylinder iron, the number of foundries in America which can produce tight, tough iron showing a tensile strength almost double that of the ordinary grades of iron used for cylinder castings, is few. The high tension cylinder metals which are employed by high class makers differ greatly in quality and tensile strength from the gray iron so commonly used, besides which it is exceedingly difficult to make use of without expensive heat treatments. Ordinary gray iron presents one very necessary quality in the cylinder castings, that is, it is less susceptible to variation in shape due to heating and cooling, which, of course, is the alternate condition of a motor.

But ordinary gray iron possesses a tensile strength only about one-half necessary for the construction of a light thoroughbred motor, and for that reason will not do.

The next step has been one of costly experimentation, devising an alloy steel-iron in which venadium is used, in order to withstand the heavy stresses and explosive forces of this highly concentrated type. However, the introduction of steels and other alloys makes a more sensitive metal than one which, if subsequent and costly heat treatments were not applied, would not give satisfactory results, in that the cylinders and pistons would tend to warp and ovalize, and that the point of highest efficiency in the

motor, which is only gained at a high heat, would show a large falling off in horse power due to leakage in gas and friction. To overcome this the manufacturer has to take several light borings on the cylinders, between which are introduced careful heat treatments to relieve strains in the metal, after which they are ground, care being observed to take only the lightest cuts. In this way both the cylinder and pistons are produced, which after repeated heatings and coolings show themselves to be round. It is needless to say that the character of the materials so employed presents the advantages of increased resistance to wear due to their tougher fibre, and that the motors so constructed often have a smaller bore and stroke with less weight and more horse power than a heavier bore and stroke made in quicker way and of ordinary gray iron.

Aside from the little higher finish given to the first-class motor in smoothing up castings and neater workmanship, there is not enough difference to the eye of an intending buyer not thoroughly familiar with these technical details to impress him with the difference in underlying quality. A thoroughbred motor of the type usually employed in the first-class cars, taking an average of six of the leading makes, would show an initial explosive force of over three and a half tons on the top of the piston, which is instantly communicated to the wrist pin, connecting rods, bearing bronzes, crank shaft, crank shaft base and all adjacent outlying parts of the structure. The shock is tremendous, and no motor constructed by ordinary cheap methods could possibly withstand it for any length of time. The motor, however, which is built of alloy steels and alloy steel-iron and special alloy aluminum with scientific exactness and care is able to deliver horse power for some ten pounds of weight and do it year in and year out steadily without breakdown and undue wear.

A salesman carefully and truthfully going over the details of his car with an intending purchaser without a single reference to any other make of car, could paint such a picture of his own as to convince any one that he was offering sufficient value to induce a sale.

It should be stated that several makers have realized this and are giving their salesmen a scientific course of training, which is sure to result in a great elevation in methods of selling, the benefits of which will not only be felt by the manufacturer, but will be appreciated by the public.

The Ignition Question.

It is sometimes instructive to listen to experts whose business it is to present one side of a problem only, even though the advantages of the other side are omitted. In discussing the ignition problem, for illustration, a representative of the Premier car says:

"The most practical system is unquestionably the one which is simplest and at the same time produces the best results and can be most depended upon.

"Continuous high speed, where all parts are worked to their maximum and under a high tension, is calculated to develop quickly any possible attending shortcomings. A glance over the list of cars which have from year to year taken part in the international endurance and speed contests will show that the winners, with few exceptions, were cars equipped with low tension make and break using magneto for current supply, in spite of the fact that in many instances two systems are regularly supplied, the second being high tension.

"The magneto used with the low tension system is the simplest possible electric generator known, requiring no attention except occasional oiling. The small amount of wiring required, and the very low potential of a low tension system, tend to make it practically immune from short circuits, due to possible contact with dust, oil, or water, which have practically no unfavorable effect upon the igniter mechanism or wiring.

"Granting that the make and break parts are properly located—preferably in the valve-cap over the intake valve —it is possible with this system to properly fire variable gas mixtures—that is, either an extremely rich or very rare charge can be fired better than would be possible with any kind of jump spark.

"The up-to-date multi-cylinder motor requires sparking mechanism, which, first of all, should be very accurate in its timing. The moving parts should be of such design as to maintain this accuracy, irrespective of motor speed. In using the low tension system, each cylinder being equipped with its own spark-producing parts, the question of number of cylinders need not be considered, as the relative velocity of these parts remains the same whether one, four or six cylinders are used.

"In a high tension system, using the present day magneto, one oscillator arm or spring performs the duty for all the cylinders of a motor, and the greater the number of cylinders the higher the velocity of the moving parts. In firing a six-cylinder motor running at normal speed of 1,000 revolutions per minute it would require the oscillator arm to make 3,000 contacts per minute. In order to time the spark accurately at this motor speed it has been found a difficult problem to prevent overtravel of parts, and time the spark in each individual cylinder accurately. Since this single oscillating arm makes the contacts for all the cylinders it is to be supposed that the contact points would wear and get out of adjustment proportionately sooner than they would on the low tension system, where each cylinder is equipped with its own igniter points.

"The low tension make and break ignition characterizes the greater number of representative European cars and many of the well-regarded makes of America, and the use of low tension system is notably on the increase, new converts being added to this system every season."

Force Feed Lubrication.

Concerning the comparative merits of force feed and gravity lubrication, Mr. Mears, of the Winton car, says:

"The chief disadvantage of gravity feed is that in cold weather oil may congeal in the tubes and fail to reach the bearings. On the other hand, the distribution of oil in the force feed system is positive. Furthermore, the faster the motor runs the more oil it needs and the more it is certain to receive.

When a non-circulating system is used, the tendency on the part of the owner is to economize on oil, since all oil that once reaches the bearings is thereafter useless. This economy may prove expensive, for failure to receive sufficient lubricant may ruin the bearings and involve a much greater outlay than the mere cost of oil. In this system the bearings may actually be flooded without heavy expense for oil or danger of ruined bearings. The proper lubricant will pass through the bearings hundreds of times without losing its lubricating qualities, and, by passing the oil through a filter on each circulation, the possibility of foreign substances entering the bearings with the oil, is eliminated."

The buying public should know—and so far as we are concerned they shall know—that the only permanently satisfactory car is a rational type, reasonably cheap in its first cost and economical in upkeep. Cars of this kind are helpful to the trade; they help to sell others, and they are the only cars which will insure the final unlimited extension of automobile use.

AUTOMOBILE DEALER AND REPAIRER

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ADVERTISING RATES MADE KNOWN ON APPLICATION.

NEW YORK, NOVEMBER, 1908.

Missing Numbers—Our readers are requested to remember that it always gives us pleasure to re-send numbers which have gone astray in the mails.

KINDLY FAVOR US.

Of course, most of our readers are aware that no trade paper could be published at a low subscription rate except for income from advertising.

In getting advertising, as a matter of course, THE AUTOMOBILE DEALER & REPAIRER has been handicapped by its youth, and for a good while by its lack of subscribers.

It is perhaps not too much to say that no automobile publication in this country ever made friends faster than this one has made them. This would seem to be very clearly shown from the fact that we had to print for October 8,500 copies to meet the demand—an increase of 500 copies over September. We have now reached a position which entitles us to proper representation in our advertising department. We have the subscribers to justify advertisers in patronizing our columns.

Our readers will kindly bear in mind that most advertisers estimate the value of a trade paper or magazine by the inquiries they get—the calls for circulars or catalogues mentioning a particular paper or magazine.

We would like, therefore, to ask our subscribers to look over the advertising department, which is not very large yet, and if they are interested in any of the different announcements and wish to write for a catalogue or circular, they will confer a special favor upon us by mentioning that the advertisement was seen in THE AUTOMOBILE DEALER & REPAIRER.

PLAINLY SUPERIOR.

Although the automobile has been given great publicity, and especially in the vicinity of New York city, where it has come into more general use than anywhere else, the general lack of knowledge concerning its usefulness is still surprising. The other day an official of the fire department in a large city was overheard to say that its use in taking trucks and engines to fires was altogether out of the question. He remarked that "although it may be a little faster than horses, it is better not to be quite so fast and be sure you will get to the fire."

It seems to us that if this fire official had been fully posted as to the needs and conditions of his business, he would have known that automobile service is already being used in many cities with entire satisfaction, and wherever tried is proving both a better and cheaper service than horse-drawn vehicles. That it will finally come into universal use for fire departments simply goes without saying.

While there may still be reason for discussion as to its advantage compared to the use of the horse on extremely bad and hilly roads, where the use is infrequent, speed is essential, and the roads and streets are fairly good, its advantages and cheaper cost of maintenance are plainly apparent.

WAITING FOR THAT BATTERY.

Although Thomas A. Edison has been essentially a man of achievements, he has not always accomplished what he claimed he would, so when he announced to a waiting world some seven years ago that he either had perfected or was about to perfect a storage battery that was destined to revolutionize the automobile interests of the country, there were some who were skeptical. But it was not so with Eleanor Robson, the well-known actress, who not long ago went out from New York to see the so-called wizard at Menlo Park, and as a result he promised that within fifteen days she should have a set of his new batteries. The regular type of electric car was comparatively useless to the actress inasmuch as she spends a considerable portion of her time in the surrounding country, and the battery that hitherto has been capable of lasting only 60 miles has proved unsuitable for her purpose, as she aims to cover considerably more than that distance in 24 hours. Something was necessary that would last at least double that distance, if the automobile was to be of any value to her, and hence the genius of Mr. Edison came at exactly the proper moment to suit Miss Robson's purposes. It will be some months before the new invention will be placed upon the market, but when Miss Robson gets her battery she will travel to and fro with the consciousness that she has made a personal attack upon the invention and has captured it without a struggle.

The new battery is claimed to be 50 per cent. more durable and has a capacity nearly 150 per cent. in excess of the familiar types of accumulator, while its lasting qualities are enormous and the price is infinitesimally greater.

But more than 15 days have elapsed since Mr. Edison promised the celebrated battery, and so far as we can learn at this writing Miss Robson has not yet received it.

LIFE OF AN AUTOMOBILE.

The average life of an automobile is placed at altogether too short a period by even those who are interested in making it popular and who should know better. Although the tires and certain parts of the engine are naturally subject to wear and must be replaced frequently when in constant use—and especially if they are used unwisely—yet there are other parts like the body, the seats, the frame, and, we may add, the springs and other parts, that receive absolutely no friction wear whatever, and will last almost indefinitely with proper care.

In comparison with the horse, carriage and harness combined, the car is far longer lived even with the wide difference in mileage of the two means of travel. But if a comparison be made by the mileage alone—and this is

the only fair comparison—the capacity of the automobile, or the life work it will perform, is several times that of the horse-drawn vehicle.

Dealers should not underestimate this. Give the automobile its due; no more and no less. It is true that instances can be cited where automobiles have quickly worn out and became practically useless, but in every case it was due to reckless use or inferior cars. On the other hand, even a good horse lasts but two or three years if used constantly in city streets.

The only thing needed to-day to relegate the horse to the realm of luxury or individual taste is to show that the automobile is far less expensive in the long run. And this can be easily done.

CHAIN AND SHAFT DRIVE.

One of the well-known automobile manufacturers makes the following prediction: "No car claiming to be of the highest grade and quality can in the future be successfully marketed with chain-drive mechanism."

Although we have no interest in any special kind of car or mechanism, nothing is hazarded in saying that it is yet to be demonstrated that the shaft drive is superior, all things considered, to the chain drive. In the matter of look and cleanliness the shaft drive has the advantage, but as a means of power transmission nothing has yet been found that equals the chain drive. Its advantage where little power is required may not be of any consequence, but where subjected to great strain it causes much less friction than the shaft drive.

Ask almost any machinist and he will state emphatically that when a great strain is put upon gears the tendency of the gears to fly apart is enormous and produces much friction. On the other hand, no matter how much pull is put upon the chain and sprocket, the friction is very little increased.

At present the proportion of chain to shaft drives is about as three to four, with a tendency to still further displace chains for shafts, but this is far more due to public demand than to actual merit.

THERMIT WELDING.

In response to numerous inquiries concerning thermit welding, which was made the subject of an article in the October issue, it may be stated that after a more exhaustive investigation we are convinced that the process is more especially adapted to the repair of large wrought iron and steel sections that must be welded in place or without removal from where they are used. For small parts in automobiles the cost of making the welding would make the repair cost too much. This, at all events, is the conclusion arrived at, but if any reader, after a test, has found the facts otherwise than as stated, we shall be glad to hear from him.

Air Cooling.

Although few gasoline engines are so constructed that air cooling is possible, and most manufacturers maintain that water cooling is to be preferred, it is well enough to remember that air cooling has been found practical and satisfactory in some cases, and the Franklin car is a notable example of its success. The following is what Mr. Franklin, of the Franklin car, claims for it:

"The advantages of the air-cooled motor are: (1) Absence of complication; (2) light weight; (3) usable every day in the year in all climates; (4) highest efficiency. The importance and advantage of eliminating weight is not open to argument. It is a settled proposition. The air-cooled motor eliminates the weight and the complication which is necessarily a part of the water-cooled motor. The lighter the motor, or the lighter any given part or unit of the automobile, the lighter the whole motor car can be made. Add weight to the motor, and weight must be added elsewhere to carry that weight.

"The air-cooled motor is always ready. It is not affected by climate or by temperature. It can be used every day in the year in every climate of the world, and this without extra care, attention, or thought. Any attempt to use a water-cooled motor on a cold day requires special care that the water does not freeze, while in hot weather the machine must have constant attention to see to it that it has enough water, and that the water is not too hot.

"It is a self-evident proposition that if the air-cooled motor will cool as well as the water-cooled motor, it is a better proposition. In other words, the advantage of doing away with the extra complication and weight is conceded. The perfect air-cooled motor has no disadvantage not present in the water-cooled motor, and it has many advantages.

"All air-cooled motors are not successful. The same is true of water-cooled motors. But the water-cooled motor is an easier proposition—even if crudely made it is fairly successful. The Franklin air-cooled motor is not only a successful motor, but it stands as the highest type of automobile motor ever made. It is also a well-established and well-recognized fact that the air-cooled motor has higher thermal efficiency than the water-cooled motor; in other words, the air-cooled motor consumes less gasoline per horse power."

Learn to Stop the Car.

Winthrop E. Scarritt, was one of the speakers at the opening of the Automobile School of the Young Men's Christian Association in New York recently.

Mr. Scarritt, addressing a large company of automobilists and young men who are to become drivers of motor cars, uttered some timely words of admonition, which, if heeded, will greatly minimize the risk of motoring.

After calling attention to the rapid development of the motor car industry and congratulating the Young Men's Christian Association on the excellent work it is doing in training bright, active, clear headed young men to be competent drivers, Mr. Scarritt said:

The first obligation of an automobilist is that he should have a conscientious sense of his responsibility to the public and a keen appreciation of the fact that he is driving a more or less powerful locomotive through the public streets and highways. He is under obligation to remember that the highway belongs to all the people and that the law gives the right of way to pedestrians. He is under obligation to master his machine. Here ignorance is a crime. The pushing of the wrong pedal or the pulling of the wrong lever at critical moments may mean death and disaster to passengers and pedestrians alike. Therefore a complete mastery of the motor car at all times is of decided importance. The automobilist is under obligation to the public, from whom he gets his rights to operate his motor car, to protect, and not menace, it; to drive with the greatest care and the utmost consideration for other users of the highway.

The motorist is under obligation to be constantly on the alert to prevent accidents due wholly to the fault of others. A deaf man steps off the sidewalk in front of an automobile or a boy darts from behind a tree. If the driver be not alert and so trained that he instinctively does the right thing, disaster follows.

The young driver should repeat over and over again, What shall I do to stop quickly? Push out that clutch, pull on that brake, push out that clutch, pull on that brake.

By constant repetition and practice one learns finally just what to do when the moment of crisis comes apparently without lacking time to think. You have all day in which to start your car; your life may depend some day on how quickly you can stop it.

Perhaps all these rules may be summarized in one—master your car; keep a cool, alert head, and treat the other man on the highway as you would like to be treated.

LESSONS FOR DRIVERS.

Carelessness and Ignorance Responsible for Most Accidents.

Reports of accidents continue to come in with startling frequency. It seems almost astounding that drivers of cars will not learn the needed lessons from them. With the safest vehicle that has ever been used by man, there would be absolutely no danger whatever were it not for the speed-mania and the lack of ordinary care in car inspection. Below will be found brief records of such accidents as seem the plainest object lessons, no record being taken of those where the car drivers were not clearly at fault:

Brake Rod Broke.—While descending a hill in Quincy, Ill., the other day, the brake rod broke which connects the foot lever with the back brake. There were four in the party and the car was soon going at a terrific speed. Straight ahead was a precipice on one side and a turn in the road too dangerous to attempt. Grasping the situation, the driver suddenly ran the car into a bank on the side of the road. The bank was soft, and although the car was overturned and struck with terrific force, it was somewhat broken by the top of the car, and no one was seriously injured, although one had an arm broken.

Ditched Car to Save a Girl.—In Bangor, Me., not long ago, a car in which were five persons was approaching two children in the road. When about thirty feet away one of the children crossed the road in safety, but the other waited until the car was within five feet of her before she attempted to cross. In trying to avoid the little girl the chauffeur ditched the car, overturning it, throwing out and seriously injuring the passengers, breaking a rear wheel and causing a most lamentable accident. In the press account given it was stated that the driver was in no way to blame for the accident. Of course the children should have kept out of the road, but knowing that a child is liable to cross the road at any time before an approaching vehicle, the careful driver will slow down so that the car may be stopped before any such accident occurs. It is not a satisfactory condition when children are allowed to thus use the highways, but knowing the chances, the driver should always be prepared for them.

Who Was to Blame?—In Kansas City, Mo., recently, a car was proceeding rather slowly on the street. The driver states that "the rain shields on the car obstructed a side view of the street, and I did not know that anybody was crossing at the point," when he struck a woman and killed her. According to the newspaper report the driver was arrested, but afterwards released, and "officers who were detailed secured the names of ten witnesses who saw the accident, all of whom declare that it was not the fault of the driver. They said the woman carried her umbrella in such a way that she could not see the street." If this case is ever brought to court the driver will be clearly held responsible. The courts have repeatedly held that the rights of pedesrtians are superior to those of vehicles, and they would undoubtedly hold that in walking in the street in the rain an umbrella may be held over the head even though it does obstruct the view.

Brake Rod Broke.—At Asbury Park, N. J., recently, a man alighted from a trolley car and was struck and killed by an automobile as he was attempting to get out of the way of a passing carriage. The driver of the car broke the emergency brake rod in trying to stop. The driver was arrested and put under heavy bail for "atrocious assault." He says he was not going over 12 miles an hour, and if so he should have been able to stop quickly without breaking anything.

A Slippery Street.—When will drivers learn that it is courting destruction if not death to drive rapidly on slippery streets? In Lawrence, Kan., recently, a man driving a car swung sharply to one side to avoid a carriage and side-slipped into the curbing, breaking one axle, bending the other and crushing a wheel, besides doing other damage. The car also struck a sulky plow standing in the way and flung it more than twenty feet.

Careless With Explosive Fumes.—In Colusa, Cal., not long ago, a man ran his car in a garage to get a fresh supply of gasoline. The man in charge started to pour the gasoline from the measuring can into the tank, when the fumes took fire from the flame of the acetylene lamp which he had carelessly left burning. It ignited the oil and in an instant the whole front of the car was in a blaze. It required the services of the local fire department to quench the fire.

Result of Making a Sharp Turn.—Seven persons were hurled with a car over a sixteen-foot embankment near Albany, N. Y., when attempting to make a sharp turn at the approach to a bridge over a small creek. It was stated that the steering gear was wrong, but steering gears will not keep cars in the road when attempting to take turns at high speed. Two of the victims may not live. The other five are expected to recover.

All Due to a Sneeze.—Because their chauffeur was forced to sneeze, an automobile with a party of four shot over a three-foot embankment and was overturned. The damage was not serious, but it might have been, since the concatenation was sufficient to cause the driver to momentarily lose control of the car.

Could Not See the Train.—Unable to see the approach of a fast flying train on Long Island, N. Y., owing to a turn in the road, a wealthy young Brooklyn girl with a lady companion drove her car on the track and it was hit by the locomotive and smashed to splinters. Strange to say, neither was killed, but both were seriously injured. If such accidents continue, drivers may finally see the necessity of always coming to a stop before crossing a railroad track at grade.

Result of Cranking.—At West Mentor, Ohio, a man left his car and went across the street. He says he left the lever at neutral, but when he returned he attempted to crank the car, when it started up and shot backwards, knocking horses and wagons over and creating much damage. The owner says some one moved the lever when he was away.

Two Cars Have a Collision.—Near Chicago two giant cars were approaching each other at right angles. Each put on speed thinking to pass before the other

reached the junction; each should have slowed down to allow the other to pass. The collision and impact was thus terrific. Five persons were seriously injured and are now in hospitals or laid up in their homes, and the two valuable cars are wrecks, one being almost cut in two.

The Deadly Telegraph Pole.—A young woman was riding near New Britain recently with her affianced, when in attempting to turn out for another car their car skidded and struck a telegraph pole, and the young woman was thrown out and killed. The rear of the car was completely demolished.

Caught in the Railroad Track.—While driving near La Porte, Ind., the sole occupant of a car was pinned under the overturned car owing to the front wheel having caught between the guard rail and the other rail of the steam railway track. The occupant was not hurt much, but the car was much damaged.

Not Afraid to Go Home in the Dark.—Near Goshen, Ind., a party of five were attempting to go home without lights on their car. They ran the car off the edge of a bridge and all were rendered unconscious. The car was wrecked almost beyond repair, and one of the party had his head badly cut.

The Car Suddenly Veered.—An automobile containing five persons took a frightful plunge and went over an embankment 31 feet high near Pottsville, Pa. Two were killed and three badly injured. They were going down a steep incline when the car suddenly veered and went over an embankment. The living were found unconscious, and the two dead were taken to their homes. Of course the cause of the "veering" was some obstruction in the road.

Car Struck a Wet Place.—A party were going through Newark, N. J., the other day when their car struck a wet place in the road. It skidded across the road, crashed into a fountain and then shot across to a telegraph pole. The car was valued at $10,000, and was owned by Charles M. Schwab. Experts say it will cost more than a house and lot to repair it. The occupants were thrown from 15 to 20 feet and were unconscious for several hours.

Only a Lighted Match.—The danger of hunting a gasoline leak with a lighted match was illustrated recently on Long Island, when John Brennon caused an explosion that literally blew his wife and sister out of the car. The ladies didn't appreciate the experiment, and Brennon, after seeing his machine burn, agreed with them.

Horse Power of Engines.

Frequently readers write to ask us the horse power of a certain engine, but for data to compute this they seldom give more than the diameter of the cylinder and the length of the stroke, the important fact of the revolutions per minute is seldom stated, and, of course, nothing is known of the carbureter or of the ignition. In such cases the answer is given with certain mental reservations and restrictions. It is based upon general experience and may be in error by as much as 25 per cent., depending upon the design of the engine.

Nor is anything known as to the operation of the valves or regarding the timing of the valves and the area of the inlet and exhaust ports. It is known that the power of an engine can be increased by opening the throttle so that the power of the engine will be increased with large and larger inlet port areas, or until the proper area is formed. If an engine is not properly designed so far as inlet port area is concerned the power cannot be accurately estimated.

The power will also vary as much as 20 per cent. if a poorly designed carbureter is used. There is also a variation in the power developed by carbureters of the same type and size, and in different types of the same size made by the same firm. An important factor in power development is the kind of an ignition system used. Much has been said about the extra power that is developed from a good spark. It is not because of the heat of the spark itself that one gets the greater gain, but because of the effectiveness of the hot spark in giving more rapid firing of the whole mixture and consequently causing a greater power to be developed.

Quite a factor in the power developed by an engine is the per cent. of clearance of the engine, which determines the compression pressure. There is a great variation of the compression in different makes of engines as well as in engines made by the same firms. The power varies greatly with the compression pressure and may be as much as 40 per cent. in small sizes of engines.

No formula can be given that will be sufficiently general to take into consideration every factor governing the power, but the best is by using the probable mean effective pressure in the cylinder during the working stroke. Multiplying the area of the piston in inches by the mean pressure gives the total pressure, and this product multiplied by the length of the stroke in feet gives the foot pounds of work per working stroke. If the total foot pounds of work per working stroke is multiplied by the explosions per minute, the result will be the foot pounds of work developed per minute, which, if divided by 33,000 gives the horse power developed in the cylinder. The result must be multiplied by the mechanical efficiency of the engine to get the power developed. It requires a considerable knowledge of gasoline engine practice to make use of the above formula. What is needed is one that is more arbitrary and fits the majority of cases and, moreover, requires the use of only a few facts, such as the diameter of cylinder, length of stroke and revolutions per minute. This is found by multiplying the square of the bore by the stroke, and this product by the revolutions per minute. Divide this sum by 1,800. Not knowing the other facts mentioned, this is as accurate as the power can be estimated.

A New Rear Axle.

The Timken Roller Bearing Axle Co., of Canton, Ohio, has invented a new rear axle. The weaknesses of the present built type of axle lie in the necessity for a truss, which in itself is a complication and a creator and conductor of vibration. The new Timken axle is a one-piece pressed steel form, made of special basic open-hearth high-static resistance steel, shaped to give better than truss resistance to load, end thrust and breaking strains and eliminate the vibration common to cast or forged axle of the built-up type.

From the hubs inward, as the thickness of the metal decreases, the circumference of the tube increases and finally merges into the globe of the central case by a graduated flare, thus avoiding sudden angles or changes of direction which ordinarily add leverage and interrupt shocks and stresses at the points of least resistance.

The entire load-bearing and gear-encasing member is a single unit, clear and smooth without angles or protruding parts, supports or braces, with nothing to vibrate, nothing to rattle, nothing to work loose, nothing to catch mud and easy to clean.

GASOLINE STORAGE.

Some of the Methods Employed for Installing Oil Tanks.

Occasionally some one wants some means arranged so that gasoline may be stored in bulk. There are various descriptions of gasoline storage tanks and cylinders procurable, and some of them are very useful. But many users of gasoline for automobiles desire to construct or have constructed some style of tank under ground, arranged to suit their peculiar circumstances. Perhaps the party runs a garage, or maybe he is a repairman and finds that it is necessary to have an outfit of oil at hand for

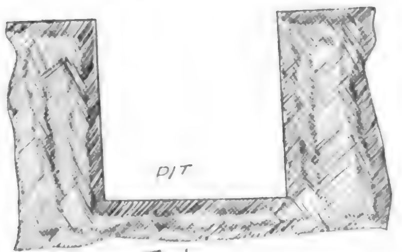


Fig 1

the numerous calls he has for supplies for gasoline machines. Or he may be a dealer in parts of automobiles or perhaps sells machines complete. He may be only an agent, selling on commission, but still automobilists will appeal to him for a supply of gasoline at times. When the tanks get low on a motor vehicle the owner of the machine is liable to apply at the drug store, the livery stable, the hardware store and almost anywhere in his desperate efforts to secure a supply and avoid stranding en route. Therefore, almost every person who handles anything concerning automobiles finds that it is not only con-

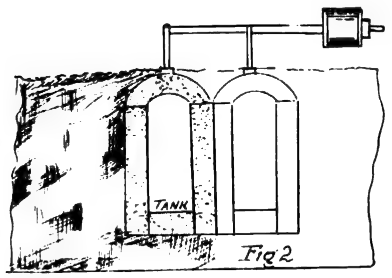


Fig 2

venient but profitable to handle gasoline. As a result, the motor repair men are besieged for plans and specifications for the making of storage facilities for gasoline in bulk.

The adjoining sketches will illustrate some of the methods employed in installing oil tanks. The object is to build underground, so as to avoid fire risks. Usually cement or concrete tanks holding from ten to thirty barrels of oil are required. For the garage owned by an individual, a small tank will do, but in case the party handles oil for the profession a liberal-sized tank is needed. Iron tanks may be put in, and even all wood ones. But the wood gets soggy in time, unless lined with sheet metal. The iron tanks are good and lasting. Still, the majority of tanks nowadays are built with cement. The modern forms of concrete made it possible to construct a durable tank in the ground at a convenient point to the run of the machines. The first operation involves the excavating of the ground. The proportions of the hole will, of course, vary according to the size of tank you intend to put in. Fig. 1 shows the hole in readiness for the concrete. Fig. 2 illustrates the concreted walls. The process of building up a concrete wall for this purpose is like building all walls of concrete. The earth forms the exterior side of the mold, while planks held with set clamps and wooden pins are adjusted for forming the interior surface. Hence, with the molds erected, with the interior planks and the exterior surface of earth, the

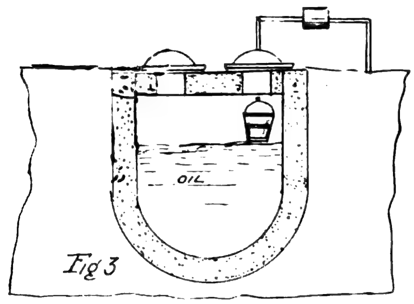


Fig 3

filling in is easy. The concrete is packed in the mold forming the four sides. The bottom is filled in with the proper depth of cement. In case a double tank is needed, or a division is installed, as in Fig. 2, then there will be need of central partition walls, erected by constructing plank molds for filling in as for the sides.

The lids or caps are molded separately and are placed in position on the tank tops when the walls of the tanks are dry. The force pump pipes are extended through the caps by boring the necessary openings through the cement for the purpose.

After the planks are removed, and the tanks are cleaned out, it is necessary to clean off the walls with any cleaning substance and put in something to prevent leakage. The application of wax compositions is one of the methods now employed. Common paraffin wax is heated and ap-

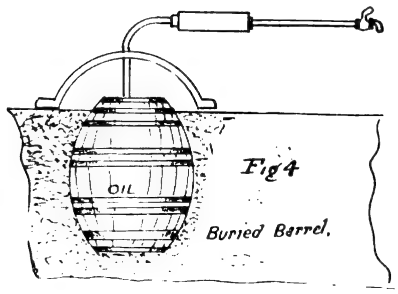


Fig 4

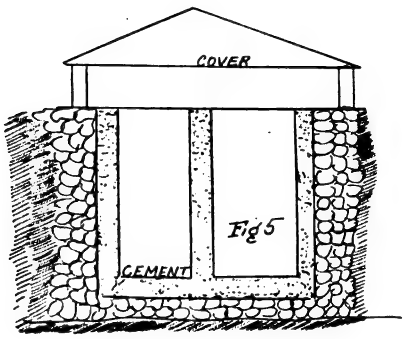
Buried Barrel.

plied. The walls of the tank are correspondingly heated with fires or by use of a blowpipe. Plaster your wax on the surface of the tanks and fully saturate. Gradually the wax works its way into the pores of the cement. Some men roll the wax surface with hot irons, so as to assist in forcing the composition into the concrete. The idea is to load up the pores of the concrete with wax. After

several applications the concrete walls and bottom will be laden thoroughly with the wax, and a non-leaking cistern results.

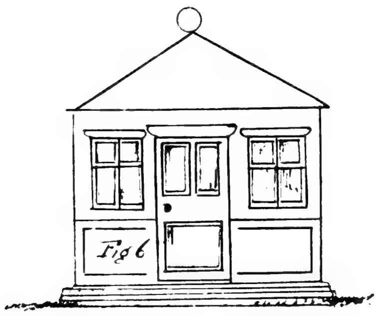
It is not necessary that the bottom of the tank be flat. Some prefer rounded tanks or kettle-bottom tanks. A party put in a tank of the character shown in Fig. 3 and obtains good results from storing oil in it. There can be two manholes or one. The manholes can be of ample size for the dipping of oil with a ladel or a pail, in case that the pumping outfit gives out. Or perhaps the tanks may have to be cleaned out at times. Then baling out will be necessary, unless the force pump is employed.

I have seen oil barrels buried in the ground as illustrated in Fig. 4. Then, in order to make the top supposed-



ly fireproof, a metal bell is placed over the same of the order shown in the drawing. The oil barrel is partly or wholly sunk into the earth. The drawing pipe is placed through a bore in the head of the barrel and the pipe is extended over to the pumping contrivance. The necessary supply of oil can be drawn at will, and the arrangement is handy. But it is a careless method of storing gasoline. Besides, the barrels almost always leak and there is a loss of oil, and in time the earth gets saturated with the residue of greasy matter.

Another type of cement gasoline tank is exhibited in Fig. 5. The excavation was first cut in the earth, and then built up with wall stones. Cement was freely applied and the walls were slowly defined. Then a cover made mostly of sheet metal was adjusted as shown. The usual



line of oil-drawing pipes were adjusted and a force pump used. But the cover proved to be defective. Odors passed out of the tank. The insurance people objected to the plan. Then a little building was erected over the whole thing as shown in Fig. 6. In order to comply with the demands of the insurance people, some heavy lift lids were placed over the tops of the tanks and worked with block and tackle with chains. The metal tops were bored for pipes and the common form of gasoline pumping arrangement put in. The house protected all of this apparatus.

A sign was put out, and a very lively and remunerative business in gasoline supplies was developed.

Doctoring a Carburetter Needle.

In all cases of excessive gasoline consumption it is not enough to see that it does not drip from the base of the spray chamber when the car is at a standstill with the engine stopped. Much gasoline is commonly wasted from the float chamber, owing to the needle leaping off its seat under the influence of road or engine vibration, and so failing to cut off the gasoline, which promptly overflows. We have found two methods of dealing with this nuisance satisfactorily. On one car the flooding only occurred with the car in motion, and was solely caused by road vibration; in another flooding occurred whenever the engine was running fast, irrespective of whether the car was on the move or not. The first and more makeshift of the two methods was to remove the cap which ordinarily protects the upper end of the needle and file away the top of its boss, so that the cap could then be screwed right down on to the needle, so as to press it firmly into its V bed; the cap was then unscrewed back the merest trifle, so as to allow only a sixteenth of an inch upward motion to the needle. This does not entirely obviate jumping, but returns the needle to its seat pretty promptly whenever it hops. We then bound wire round the bottom threads of the boss to prevent the cap screwing itself down and binding the needle down altogether. Another plan is to drill a hole in the top of the cap and use a set-screw and lock-nut to damp the needle; and yet a third is to fit a light spring soldered to a disc or thimble inside the cap, which resists the jumping of the needle, allowing the gasoline to force the needle up by means of the float. It was not until we acquired a carburetter possessing a screwed in valve seating that we were able to devise a really simple and permanent cure.

We took out the original seating altogether, and had a fresh seat made of German silver, with the V seating for the needle upside down. We then had a new needle made, also of German silver, with an inverted V face on its bottom end, inserting this needle from the bottom of the float chamber, instead of from the top. This method of construction enables the delicate and costly collar and balance weights to be dispensed with altogether, and their place is taken by a wire cotter, gripping a groove turned on the upper part of the needle. All vibration then lifts the needle exactly as before, but with an inverted valve lifting the needle cuts off the flow of gasoline, and so combines with the float action, instead of resisting it, as is the case with the normal type of V valve. One or two carburetters fitted with this inverted valve are now coming upon the market, and there is no doubt that this arrangement conquers the flooding tendency, besides being simpler and cheaper to produce from a manufacturing point of view.

Cuts and Punctures.

If cuts are found in the tire they should be cleaned with naphtha and filled in with rubber solution, which should be allowed plenty of time to set before the edges of the cut are closed together. If any discolored patches are to be seen, they indicate that damp has penetrated through some cut in the rubber near the casing. This puncture should be closed up, while the moisture can be extracted from the fabric by placing it in a moderately warm atmosphere and allowing it to remain there for some time. If the tire is in such a condition that to attempt a home repair would be out of the question, the opportunity would be a favorable one for sending it to the factory for necessary repairs. None but the simplest repairs should be undertaken by the amateur, if time and opportunity permit of them being done by the manufacturers.

If you don't see what you want, ask for it.

REPAINTING.

Some Necessary Surfacing Processes on Automobiles Described in Detail.

BY M. C. HILLICK.

Like his brother in the carriage paint shop, the automobile painter must in many cases, at least, cheapen his methods of surfacing and repainting to conform to the limits of the vehicle owner's inclination to pay. Sometimes he is inclined to pay abundantly, and again his ambition is to get the work performed for a miserly pittance. In case of the latter extreme it becomes necessary, to avoid taking advantage of the bankruptcy law, to cheapen the surfacing methods, while at the same time working to establish a satisfactory degree of durability.

For the automobile requiring a preparatory surfacing pigment to fill the fissures and cracks in the old paint structure, upon which to lay the color and the varnish, with a minimum ruling price, the work may be performed as follows:

Sandpaper the old paint down close and hard with No. 2½ sandpaper. This serves to smooth away any existing nuggets of dirt, and to break away the edges of the cracks and paint fractures, showing them precisely as they are.

Next dust off the surface and apply with a camel's hair brush a coat of thin lead prepared by breaking keg lead, oil ground, up to a brushing consistency, as above, in turpentine. This renders the coat sufficiently elastic, and at the same time thin enough to penetrate, and, to some extent, seal up the surface fissures. Permit this pigment forty-eight hours to dry, and then with a glazing pigment made of dry white lead, ⅝; rough stuff filler finely ground, ⅛, and keg lead, oil ground, ¼, whipped to a free knifing consistency in two parts of rubbing varnish, and one part each of coach japan and turpentine. Apply with a broad, two and one-half-inch width scraping knife, half elastic, using the pigment just thick enough to work easily under the knife and to press into and block up the crevices.

Allow the pigment to stand twenty-four hours and then with regular hard putty, made of dry white lead, mixed to stiff consistency with equal parts of rubbing varnish and coach japan, go over the surface and putty all holes and deep cavities, if any. Let the surface stand another twenty-four hours, and then proceed to rub the plastered pigment with artificial pumice stone or rubbing brick dipped freely into raw linseed oil. Rub the surface down clean and smooth and dry it off with some soft cloths saturated with denatured alcohol or turpentine, the former being much the cheaper medium. Then proceed to color and finish in the usual way.

Another practice for stopping up a cracked surface cheaply consists of coating the surface, after sandpapering it, with a thin smear of gold size japan. When this is dry knock the gloss, if any, down with a rasp of No. ½ sandpaper and apply a mixture prepared thinly: English filling, 1 part; dry white lead and best bolted whiting, 3 parts each, the whole being stirred in equal parts of coach japan and rubbing varnish. Then thicken by adding one-quarter the total quantity of corn starch, after which cut slightly with turpentine to enable it to be worked over the surface with a stiff brush. As soon as the mixture stiffens up briskly the surface should be knifed over with a broad, elastic scraping knife, forcing the pigment strongly into the cracks. After forty-eight hours rub out with rubbing brick dipped in raw linseed oil.

For a still less expensive job—for an auto to sell or trade, perhaps—sandpaper the surface and coat it over with a liquid glaze composed of one part each of raw linseed and japan and two parts turpentine. After twenty-four hours mix anti-kalsomine, the binder or fixer of which is cement, in hot water to a brushing consistency and apply freely to the surface. Permit the first coat to stand over night before recoating. The following day apply two additional coats of the mixture. The day after rub out with rubbing brick dipped generously in raw linseed oil.

However, by way of contrast, let us note the method of surfacing over the old paint structure in a really first-class way. First cut the old paint down clean and neat with No. 1½ sandpaper. Next coat it up with a good honest coat of lead containing a binder of raw linseed oil and thinned with turpentine to flat out nicely on the surface. When dry look the surface over keenly, and with the hard putty previously described putty up all cavities. Permit this to dry twenty-four hours, after which apply four coats of rough stuff, at the rate of two coats per day, mixing the material after this formula: Of dry white lead and any good American rough stuff filler use equal parts, by weight, thinning to a stiff paste consistency in equal parts of pale coach japan and rubbing varnish, next thinning to the proper working consistency with turpentine. Rub out with rubbing brick and water to a fine, uniform surface. Then color and finish after approved processes.

THE ELECTRIC CAR.

Wiring Diagrams and Simple Explanations of Correct Methods.

BY ELECTRIC.

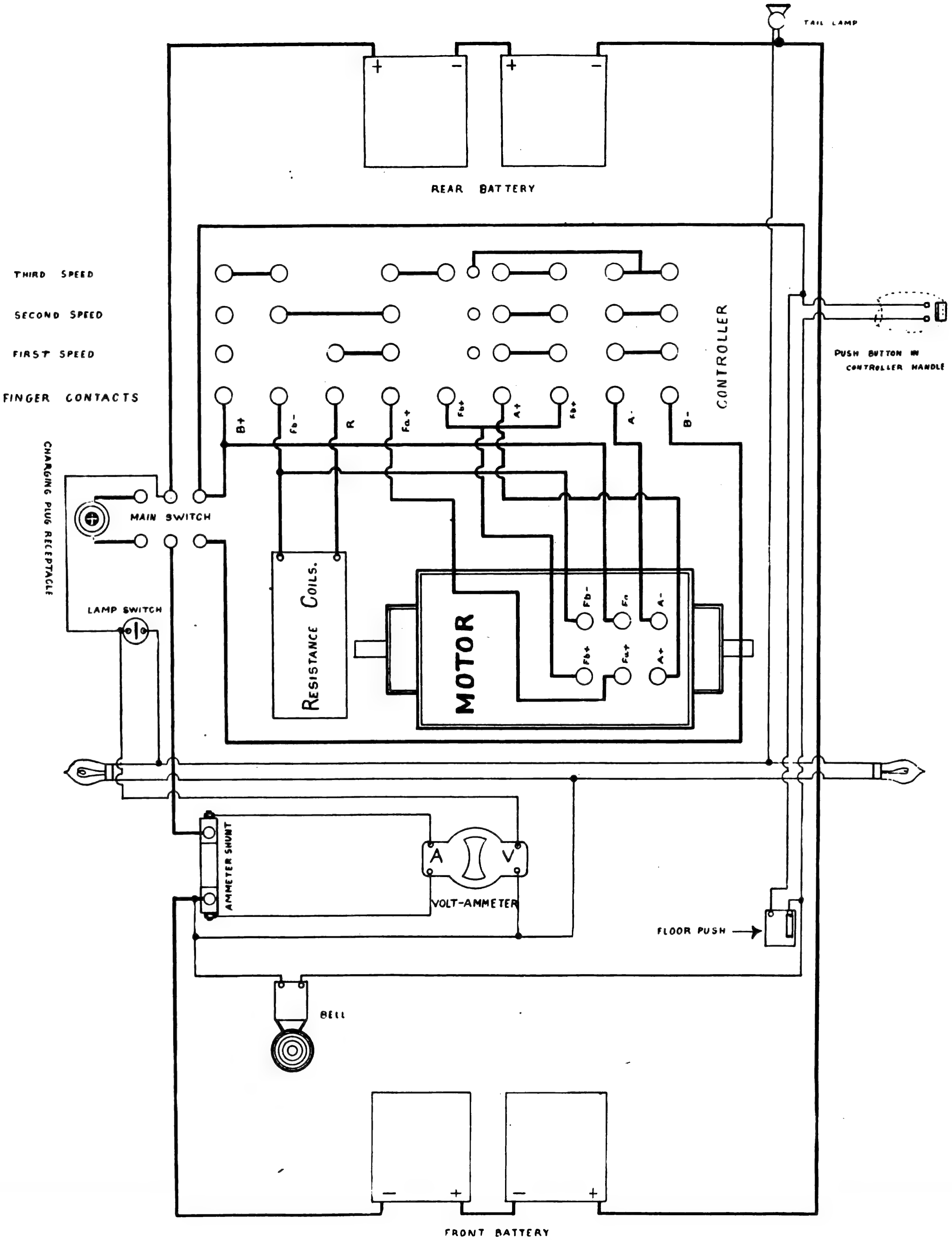
Having been a reader of THE AUTOMOBILE DEALER AND REPAIRER since its birth, I have looked in vain for some information regarding the motive power, its control, etc., of the electric automobile. The gasoline automobile is fully illustrated, its troubles are dealt with in an able and exhaustive manner, but not the electric. Why this discrimination, especially when the electric vehicle is increasing in such large numbers, both for pleasure and commercial purposes?

Such, then, is my friendly criticism, made in the hope that it will stimulate and increase the already large field of usefulness of THE AUTOMOBILE DEALER AND REPAIRER. Honest criticism is necessary to further advancement, and is always desired by those who are seeking for improvement, but to offer the assistance necessary to remove the cause of criticism is better, for it supplies that which was shown to be lacking, hence this article.

The author is by no means an electrical engineer, but his experience in the building of an occasional vehicle and the knowledge gained by regularly repairing them, puts him in a position to advise those who may not be so fortunate. This article is not intended for those well versed in the repairs of the electric current; it is only for those, who, like the writer, desire to know more about this unseen power in its application and control to road vehicles.

The electric vehicle proposition is a very interesting one to the progressive carriage and wagon builder, for no self-propelled vehicle is more easily operated or taken care of, and certainly none more closely fits into the builders' present organization. The various parts which go to make up the running gear can be purchased separately or complete. In the latter case all there is to do is to build the body, wire up and paint.

With the selling of the complete vehicle the transaction is not, however, ended, for as builder he will find his chances greater for repair work than with horse ve-

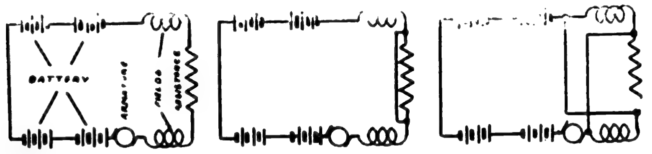


ELECTRIC WIRING. FIG. I.

hicles, for they cannot be repaired by any individual who happens to possess an anvil and a vise.

In Fig. 1 will be found a wiring diagram of a four battery, one unit series, wound single motor equipment, complete with bell, lamps and voltammeter connections. The main switch is a two-pole double throw, the upper center pole being marked + plus, or positive and the lower center pole marked — minus, or negative. When the switch is thrown to the right it is in the running position, when thrown to the left for charging, and when in the central it is neutral. This last is the position it must always be in when the vehicle is idle. By following the wire from the rear battery to the main switch and assuming that the switch is thrown to the right or running position, the current will be found to go to contact finger +. As there is no connection with this finger on the first speed, the current goes to the motor field, Fa—, thence to Fa+, and back to the controller, at finger Fa+. Here contact is made with R through the controller, which leads the current through the resistance coils, the object of which is to cut down the current before again entering the motor so as to give an easy and gradual start to the vehicle. This makes the first speed extravagant, as it takes the same amount of current as the second speed, the difference between the amount of current consumed in the motor on the first and second speeds being dissipated in the resistance coils in the form of heat, hence this speed is used as little as possible, it being only a starting and not a running speed.

After being reduced in the resistance coils, the current goes to the contact finger, Fb—. No contact being made on the controller with the finger, the current goes to motor field Fb—, issuing from Fb+, continuing to contact finger Fb+. Here it makes connections through the controller with A+, from whence it goes to the motor armature A+, out from A— to the contact finger A—, through the controller to B—, to the main switch, through the ammeter shunt, showing on the dial of the ammeter the



FIRST SPEED SECOND SPEED THIRD SPEED

SPEED COMBINATIONS.

FIG. 2.

amount of current being consumed along through the front battery back to our starting point.

So much for the first speed; the second has the same connections, excepting the opening of the circuit through the resistance coils, permits all of the current to go through the motor. The third speed is obtained by the full current also, but the fields are connected in parallel, while on the first and second speeds they are in series. This is better illustrated by referring to the diagram where the current can be traced as making connection through the controller with the motor fields, Fb— and Fa— simultaneously, emerging in like manner from Fb+ and Fa+. This gives the maximum speed, which should be about 22 miles an hour on a good level road for a two-passenger pleasure vehicle or car. For reversing, the same speeds are obtainable. This is accomplished by mechanically changing the armature leads through the controller, either through the handle, which is thrust to one side, or through a heel press operated by the left foot.

The bell can be rung either by the push button in the controller handle or by the floor push. Either of these can be omitted if desired, but the writer has found that both are advantageous, for it happened in the case of a lady pupil recently that she could not reach down to the floor push, and as the controller handle was not wired for the bell, she had great difficulty in announcing her approach.

A word of caution to those not familiar with the electric current. They may be inclined to overlook the importance of making all connections solid. This is necessary, as one poor joint will as effectually interfere with the current as several, and unless its location is known much time will be consumed in locating the defective connection. Therefore, solder all joints and terminals.

The two inside and tail lamps are cut in and out by the snap switch. If desired, these can be operated independently by using additional switches, but it will be usually found necessary to have all lamps lighted at the same time, so that one switch will be sufficient.

In Fig. 2 will be found a diagram of the speed changes. First speed batteries in series, fields in series, with a resistance in. Second speed, batteries series, fields series, resistance cut-out. Third speed, batteries series, fields in parallel. It will thus be seen that the battery connections are not changed, but remain in series at all speeds.

AUTOMOBILE LUBRICATION.

The Various Methods and the Comparative Merits of Each Fully Explained.

BY JAMES F. HOBART, M. E.

The lubrication of machinery in general and automobiles in particular may well be divided into four methods or classes, which are tabulated below in the order of their desirability. They are as follows:

1—Oiling by hand.
2—Sight feed oiling.
3—Forced feed lubrication.
4—Continuous lubrication.

A slight distinction between oiling and lubrication may be made, inasmuch as a bearing may be oiled, yet not lubricated. This distinction, however, does not take into account the difference between substances used for lubricating, such as grease, graphite, etc. The intended distinction is merely as relates to completeness of the oiling process. Thus, when some oil is squirted into the oil hole of a bearing, that journal may have been oiled, but it is by no means certain that it has been lubricated.

Another journal may be smeared with a coating of grease and graphite. That bearing has been lubricated thoroughly, but no man may say that it has been oiled. Again, a journal is running in a bearing which is located in a bath of oil. Surely this bearing is lubricated, even as it is oiled. Therefore the terms "oiled" and "lubricated" are used in accordance with the completeness with which the film of lubricant is maintained between the two rubbing surfaces.

OILING BY HAND.

This is the oldest form of lubrication. Likewise it is the poorest form of all. It is the periodical application of oil or grease, and as it depends upon the skill and faithfulness of the operator for its efficiency, it may or may not be perfect enough to reduce friction of the moving parts to a point which shall call for the least possible expenditure of power in order to overcome friction.

The defects of hand oiling are many, and they are too well known to require discussion here, hence their enumeration will suffice our purpose. Among these defects are those of insufficient quantity of oil, its improper application—some of it being spilled or otherwise wasted—and dirt inside the oil passages preventing the oil from reaching certain portions of the bearing surfaces. There

is also another defect due from the use of too little oil; the worn-off metal collects in the bearing in the form of oil-mud and eventually clogs the oil passages, often closing them completely and effectually.

On the other hand, there may sometimes be charged against hand lubrication a great waste of oil. Too much is used; it covers moving parts of the machine other than the bearings; dirt and other grit is caught and adheres to the surfaces, cutting out the teeth of gears, wearing out friction parts, to say nothing of coating many portions of the machinery with thick layers of oil and dust. Truly, hand oiling is a relic of barbarism, and it never should be used, not even for the greasing of the bearings of brake rod or steering lever.

SIGHT FEED OILING.

Certainly a great step in advance was made when the can of oil was permanently located above the bearings and the oil permitted to flow by gravity to the points which require lubrication. The simple adjustment of a number of valves at the oil source serves to apportion the supply of oil to each bearing, and the motor driver is reasonably sure that the lubricant which enters each pipe will find its way to the several bearings which it is intended for. The addition of sight feed valves relieves the driver of much more detail, as he does not have to periodically test the quantity of oil which flows through each valve. The dripping oil to each bearing being continually in sight above the footboard, the driver can, with a mere glance now and then, keep himself fully informed as to the amount of oil which is flowing to each bearing.

But there are grave defects to this system, great improvement though it be over hand oiling. As regards the distribution of oil, too much or too little, the system must still depend upon the "personal equation" of the driver, and there is no other check upon the quantity of oil sent to each bearing. Thus, even with sight feed oiling, the bearings may be permitted to become gummed up with worn-off metal, or the machine may become coated with the collection of grease and dirt described in a preceding paragraph.

With sight feed oiling there is apt to be even a greater waste of oil than by hand oiling, and many pints of good Standard Oil product go for nothing but to swell the profits of that concern. There is not as apt to be a lack of oil as with hand oiling, for it is not as much work for the driver to regulate a lot of sight feeds as it was to chase an oil can all around, in and under his "oughtogo" wagon. Still, queer things are continually happening to sight feed equipments. Now and then a pipe becomes split, or disconnected, and oil goes to prevent the rising of road dust, while certain bearings protest by heating and squeaking against the loss of oil.

Sometimes pipes become dented so that oil can flow not at all, or only in very small quantities. When the dent is in the under side of a pipe, and particularly when accompanied by a break in the pipe, a bearing is very apt to become overheated before the lack of oil is discovered. Again, when obliged to change the oil used for a different kind, the driver may be in great trouble, for the new oil may be thicker or thinner than the kind the driver is accustomed to, thereby making necessary a complete readjustment of each valve in the sight feed lubricator. This in itself is a tedious process, and it requires considerable time as well as watching each bearing exceedingly closely until the proper setting of the sight valves has been redetermined.

Again, though the driver may have learned by experience the number of drops required each minute by the various bearings, the new oil may or may not work to the same size of drops, and the same number each minute might cause the bearings to run dry or to throw oil, according to the characteristics of the new supply. Taken all in all, the sight feed system, while a great improvement over hand oiling, still leaves much to be desired.

FORCED FEED LUBRICATION.

When the sight feed valves are cut off and the lubricant is forced directly to the bearings there are several occurrences in favor of, and some unfavorable to, good lubrication. The good things are that the oil or grease flows to its work whether the driver is watching or is not, and a predetermined quantity of lubricant is forced into the bearing during a certain period of time by the automatic method, and at the will of the dirver by the manual method.

The manual method of forced feed lubrication is not particularly desirable, though it is employed to advantage upon isolated bearings. A full manual forced feed system of lubrication consists of a group of one or more pipes leading from a grease or oil forcing device, the grease or oil being forced through regulating valves and pipes to the bearings. To lubricate, the cup or pump which serves each pipe or group of pipes is given an occasional forcing by the driver, and a portion of the contents driven through the pipes.

Thus the manual forced feed system can only be regarded as an improvement upon, or a refinement of the hand oiling method, possessing nearly all the defects of that method, except the spilling of oil outside the bearing. Force feed lubrication in the form of screw grease cups is very desirable upon single isolated bearings, and it is also valuable as an auxiliary or reserve form of lubrication in case of failure of the regular form of oiling. Even the regular screw grease cup responds automatically to a demand occasioned by heating the bearing, for an increase of volume of the lubricant as the cup becomes heated by conduction from the bearing, drives a portion of the lubricant out of the cup into the bearing. However, this should only be regarded as a makeshift, for when bearings are perfectly lubricated they require no auxiliary or emergency lubrication.

The automatic forced feed lubrication method dispenses with all manual attention, except that of regulating the amount of lubricant which shall be forced into each bearing. This must be done by the driver, and it is about all he has to do except to see that the oil reservoir is kept supplied. Still, this system is open to the defects of supplying too much or too little lubricant, to coating the machinery with an excess of oil and to the general gumming up of machinery and wasting of lubricant as described under hand lubrication.

There are several methods of forced feed lubrication of the automatic variety, and among them may be mentioned the periodical screwing forward of a plunger or a cap by means of a ratchet device driven from the automobile machinery. Then there is the forcing of lubricant by means of a plunger pump, a by-pass pipe around the pump serving to permit a predetermined pressure upon the oil which is forced into the delivery pipes, according as the by-pass valve be adjusted.

Again, there is the small centrifugal pump which forces oil into the lower portion of a closed air chamber. The faster the pump revolves the more oil is forced past the vanes of the pump, and the greater the pressure of the confined air inside the closed chamber, consequently the faster the automobile runs, the more oil is forced through the feed valves by the air pressure and its pump. Thus the faster the automobile runs the more oil is forced into the bearings.

Another method of force feed lubrication is the electric oil pump. This little device is double acting, or really it has two single acting plungers joined together back to back and inclosed in the same case, each alternate move-

ment of the plunger forcing oil to a single bearing or group of bearings. The magnets of the electric coil pump consist of two iron-clad cup pole arrangements, the magnetizing coil lying inside and saturated at all times with the oil. A separate coil is inclosed for each end of the pump. The armature is an enlargement of the middle portion of the plungers, the same armature answering for both magnets.

The pump is actuated by the ignition current, the pump coils being simply connected in series with the battery or generator which supplies the primary coil with current. A ball valve is placed on either side of the electric plunger and acts the same as any pump valve arrangement. The "making" of the electrical contact by the timer causes the pump to act, while the breaking of the same contact causes the spark. In case of touch-spark ignition the coil in the pump adds to the efficiency of the spark coil. As many of these pumps may be connected in series or in parallel as may be found necessary. They are very positive oil pumps and work faithfully and well and do not get out of order easily.

But force feed lubrication, even with the best appliances and the most improved methods of the day, can only be regarded as a makeshift when perfect lubrication is desired. Perfect lubrication shall require no attention whatever on the part of the driver. There shall be no hot bearings, no squeaking or rattling, and there never shall be any oil visible on any portion of the machinery.

CONTINUOUS LUBRICATION.

When the ideal in lubrication has been attained there will be a continuous stream of clean oil flowing to each bearing at all times when the journal is in motion. The flow of oil shall be sufficient to remove from the bearing all worn-off metal and to carry the same away with the stream which returns from the bearing to the oil reservoir. The stream of oil thus flowing shall be ample, yes, more than ample for lubricating purposes. It shall be a cleansing and scavenging stream, removing from each of the bearings any and all foreign matter which may find its way into them.

Thus the stream of oil shall not be restricted to the amount which will barely serve to lubricate, without coating the exterior surfaces of the machinery. To this end, each journal bearing shall be fitted with generous oil channels and passages, and each shaft, adjacent to the journal, shall be fitted with oil rings or collars which shall effectively and completely prevent the flow of oil, or its spread in any manner, along the shaft or along the outer surface of the bearing housings.

The oil-collar is already developed to a point more than sufficient to meet this condition, and in addition to the providing of ample oil passages and conduits, there only remains the forming in each bearing, of cavities and passages whereby the oil sent to the bearing may return by gravitation to a pump which will care for the surplus or returned oil as fast as it flows away from the bearings. This being done, we have at last secured perfect lubrication. Namely, the plentiful and continuous flow of clean oil to a bearing and the washing out and carrying away of all the worn-out metal or oil.

Many high-grade machines are now constructed in a similar manner, and they need no lubrication. Every bearing, every rubbing or rolling surface, is provided with a plentiful supply of oil by means of a splash, or some other similar method. Many steam engines, and some internal combustion motors are built with all the parts needing lubrication enclosed in a metal case with a quantity of oil. The thrusting of moving parts into the oil, and the splashing of that liquid in every direction, causes a very effective lubrication of all bearing surfaces. But even with splash lubrication, effective as it is, there is something wanting.

SPLASH LUBRICATION.

The fault with splash lubrication is the necessity for using the same oil over and over again without removing the worn-off metal. Therefore, while splash lubrication gives perfect results when first started, with clean bearings, and with clean new oil, the efficiency of that method of lubrication steadily decreases until a time finally arrives when the charge of oil fails to lubricate. The remedy is to change the oil charges frequently. How often, depends upon conditions of use, quality of oil and the quantity contained in the enclosing case.

True, the splash system of lubrication may be, and is used to a certain extent in automobile machinery, but it necessitates the frequent renewal of the enclosed oil supply and as the efficiency of the lubrication is decreasing with each mile run, the method is not an ideal one for long and continuous running of machinery with many bearings and some of them widely separated from the splash point of the oil-case.

It is in order, then, to secure ideal automobile lubrication, to so construct each bearing and each rubbing or sliding surface, that a steady stream of oil be forced direct to the point of motion, through ample channels, and furthermore, that large and direct channels or conduits be provided for the return of the oil by gravity to a central reservoir. And furthermore, the oil upon its return from the bearings shall be passed through a filter, thence to the reservoir or tank from which the oil was originally sent out to the bearing surfaces. Two small centrifugal pumps should be used in the oil circulation, or two pump scrolls placed upon a single shaft—one for forcing oil to the bearings, the other pump for returning the used oil and incidentally for forcing the oil through a filter for removing the worn-off metal.

The "clean-oil" pump should be so arranged that when it stops there will be the smallest possible amount of oil in position to flow to the bearings. That is, the system should be so arranged that the oil flow to the bearings stops the instant (or nearly so) that the machinery stops. Also, the oil-return pump should be so connected that the oil would be forced through the muffler or through coils heated by the exhaust. In fact, the filter should also be heated by the exhaust in order that the passage of the spent oil through the cleansing device should be made as easy as possible by influence of the waste heat from the exhaust.

And lastly, the filter should be made in such a manner that it be effective in removing the worn-off metal, also that it be capable of being removed and cleaned in a very short time by washing in a very small quantity of gasoline. Thus equipped, the automobile will have had removed entirely one of the most perplexing questions of the day—that of lubrication—for none will be required from one season's run to another.

Carbon In Piston Heads.

In most engines the piston heads can be scraped clean of carbon without removing the pistons from the cylinders by means of specially formed scrapers introduced through the opening over the valves, or through the spark plug holes when the latter are horizontal. The form and size of scraper will depend on the particular engine, but almost any suitable form may be made from $^5/_{16}$ inch steel tubing 12 inches long, having the ends hammered flat and turned over at right angles in a vise. The ends are then filed straight and sharp, and the shank of any scraper may be bent to right or left if necessary or left straight. Frequently two scrapers will be needed in order to use both right and left handed bends.

TROUBLE DEPARTMENT.

Questions answered by the Y. M. C. A. Automobile School, 322 West 57th St., New York.

This department is intended to be a "trouble clearing house," and it will be esteemed a favor if our readers will add information to it from their own experience or knowledge.

Storing in Winter.

From J. R. A., Illinois.—Will you please tell me how best to leave my Northern touring car so it will not be damaged by winter? I have a small frame one-story barn, with cement floor, back of my house. It is handy for me, as I take care of the machine myself.

Can I leave it there if there is no fire without injury to paint and iron?

If I have a fire at one end of the barn nearest the engine, will it be sufficient (meaning a coal stove)?

Will it be necessary to put kerosene in the cylinders?

Is a storage battery damaged by cold and dampness?

Is a spark coil damaged by cold and dampness?

I have raised the wheels off the floor and covered the seat padding. Of course, I know enough to draw off the water from the radiator. An article in your journal on the care of cars for the winter would be a good one, I should think. I expect to make some adjustment and repair this winter, so would like to keep the machine at home.

Is there any danger of fire from stove when gasoline is shut off at car valve? My experience in our business says "No," but your journal says ask for it if you want to know.

Any other points on the winter care of a machine will be appreciated.

Answer.—Your car should be perfectly safe in the barn you speak of without a fire. Care should be taken that all of the water is removed, as a little left in the bottom of a radiator or cylinder could cause considerable trouble.

The car should be placed on jacks; the tires removed and placed in a dark, dry place. All of the finished metal parts, particularly the valve stems of the engine, should be given a coating of light oil to keep them from rusting. It is not necessary to put kerosine in the cylinders, but it is advisable to give them a small dose before using the car in the spring.

There should be no danger from the gasoline, providing there are no leaks in the tank or line.

Induction coils and storage batteries are not damaged by cold nor ordinary dampness, but a storage battery should be discharged and recharged every four to six weeks to keep the plates in good condition.

Several Queries.

From W. N. H., Wisconsin.—How can bent bows on a runabout top be straightened satisfactorily?

Do you approve giving the body a coat of linseed oil this winter? They say this makes it look like new again.

Does low tension magneto make satisfactory ignition on a 4-cylinder light touring car?

Is a light touring car supported on two semi-elliptic springs set crosswise, one in front and one on rear axle, a satisfactory thing in this respect?

Answer.—In order to answer the first question in a satisfactory manner it will be necessary for us to know of what materials the bows are constructed and at just what part of the bow the bend takes place.

Linseed oil has been successfully used for the purpose you speak of.

If the car is equipped with low tension spark plugs (make and break system), the low tension magneto would make an ideal generator. If, however, the car has the jump spark system installed and you wish to use the magneto so that you can switch from the battery to it, you will find the low tension magneto will not give good results.

This would depend somewhat upon the construction of the springs, but generally speaking, a car supported by springs set crosswise would be very unstable.

Horse Power and Timing.

From H. H. S., Pennsylvania.—How can I find out the horse power of an engine—four cycle, single cylinder, 3 inch bore and 3½ inch stroke? Also how do you time a four cylinder four cycle engine?

Answer.—There are several methods of obtaining horse power, perhaps the most practical being the A. L. A. M. formula: $HP = \frac{D^2 \times N}{2.5}$ in which D is the diameter in inches, N the number of cylinders and 2.5 a constant. The stroke is not taken into consideration. For a single cylinder engine with a 3 inch bore this would be $3 \times 3 = 9$, $9 \div 2.5 = 3.6$ horse power.

To time the valves of a four cycle gas engine, first select a cylinder to work on, say the cylinder nearest the radiator, and call it Number 1. Be sure you know the direction in which the crank shaft and cam shafts turn when the engine is running. Then turn the crank shaft over until the piston in cylinder No. 1 is at the extreme top of the cylinder and the crank just a trifle past the perpendicular position. Turn the inlet cam shaft so that the cam for cylinder No. 1 will be just engaging the valve rod to open it and have the exhaust cam for this cylinder just leaving the exhaust valve push rod with the valve completely closed. Slide the cam shaft and crank shaft gears in mesh. Give the engine one complete revolution and with the spark advance lever 1-3 advanced, set the traveling member of the commutator just coming into contact with any one of the four stationary points. Wire according to the order in which the cylinders explode. This may be determined by cranking the engine and watching the order in which the exhaust valves open.

Although manufacturers differ greatly in the timing of the valves, a general rule that will give good results is:

Inlet valve opens 12 degrees past top center.
Inlet valve closes 30 degrees past bottom center.
Exhaust valve opens 45 degrees before bottom center.
Exhaust valve closes 10 degrees past top center.

Car Lacks Power.

From E. C. L., Michigan.—I have a C 6 Olds runabout and am in trouble. My car ran very good until about a month ago, when I noticed the small sprocket worn very badly, so I replaced it and gave the engine a general overhauling. Now the car will run good for about one-half mile or until she gets warmed up, when I lose power and also have no control of the spark. If I apply air the engine pounds very badly. Am not able to run on high, or for a short distance only. When I open the switch or take off the battery the engine will run for some time, each charge exploding same as if the switch was on. Can you tell me what the trouble is?

Answer.—While the symptoms you speak of may arise from any one of a dozen different causes, I will mention those that are most likely to be the offenders. If you have thrown the carburetor out of adjustment it is very likely that you will find the trouble there. Too rich a mixture will cause the engine to lose power and overheat. If you removed the spark timing device you may not have set it properly when you replaced it. In replacing hose connections it is very easy to get part of the hose inside of the metal pipe, especially if the hose is small thus effectually blocking the water circulation. Disconnect the hose in different places while the engine is running and see that

the water flows quite freely. There may be loss of compression. This may be determined by cranking the motor. There should be considerable resistance on the compression stroke when the motor is cranked by hand. If when in overhauling the engine you did not remove all of the carbon from the inside of the cylinder, that may be the cause of your trouble.

Cost of Running a Steam Car.

From Leon T. Bunnell, Connecticut—I notice that Edmund Willey inquires as to the cost of running a steam car. My experience has been very satisfactory as follows:

I have run a Locomobile steam runabout 4,500 miles the past summer on a consumption of 250 gallons of kerosene oil. The burner is the F. W. Offeldt & Sons fourteen-inch kerosene burner. Nearly all of my driving has been over the New England hills, and some of them are very steep and rough, and this has consumed the power. I have often got fifteen miles and over to the gallon, but the average has been eleven miles to the gallon. My fuel bill has been $22.50 for the 250 gallone, at 9 cents per gallon. My entire upkeep expense has been $107.50. including an accident that cost me $25. This includes everything, tires, fuel, oil and repairs, making an average cost for all of 2½ cents a mile for the car. About one-half of the time I have carried two passengers and never have gone alone, making the average cost per mile per passenger one cent. This seems to me to be cheaper than the cost of running most gasoline cars.

From Alois M. Kransz, Chicago, Ill.—In the October issue of your valued paper I notice Mr. Edmund Willey inquires as to the cost of upkeep of steam cars. My White Steamer, Model H, has been run 5,350 miles, mostly over country roads. I have kept accurate account of all expenditures and find as follows:

Gasoline	$79.25
Tires (new casings and tubes, repairs to old ones and Woodworth covers)	242.49
Oil and grease	23.24
Light (carbide)	4.32
Sundries (taxes, insurance, etc.)	147.52
Repairs	95.77
Total	$592.59

This is an average of 11 cents per mile. I have no garage expenses, as the car is kept at home. I do all the driving, make all minor repairs and do all work, even washing, myself. Three of the first tires are still in use, one having never been removed from the wheel, though a Woodworth cover has been used with it for about 1,500 miles. The machine is working as well to-day as it did the day I received it. I would like to hear from other steam car owners how their experience compares with mine, and hope this will be of some interest to Mr. Willey and others.

Lengthening the Wheel Base.

From E. A. Atherton, Maine—I have a two-cylinder Pope-Toledo car with rear entrance and very short wheel base—seventy-six inches. A repair man here wants to build it over this winter, making it side entrance, and a longer wheel base. Will this machine require more power with a longer wheel base than a short one. I think of lengthening the wheel base sixteen inches.

Reply—The contemplated change will require no more power except for the natural slight increase in the weight of the car, and this is not material. Possibly some of our readers may have had such a change made in their cars. If so, we should be glad to know if it proved satisfactory. Information on this point would be of general interest as well as of value to the inquirer.

Wheels, Tires and Mixtures.

From R. W. C., Indiana.—I have a Ford "model N" 28 inch wheel, and have thought of having made a 36 inch wheel with solid tires for winter use. Would that make the gear too high, if it does make it higher, or would it make it lower? Would you advise the solid tires on a Ford? Would it be all right to use one-half alcohol with water in acetylene generator to prevent freezing?

Answer.—Changing from a 28 inch to a 36 inch wheel would increase the speed of the machine and decrease the leverage of the engine. You do not need the extra speed in the car you speak of, but you will need the greatest leverage obtainable when the roads get bad in the winter time. On the type of cars you speak of solid tires would be very unsatisfactory.

It is advisable to use no more alcohol than is absolutely necessary in an acetylene generator, as the alcohol will not generate gas, and in some types of generators it would be impossible to feed sufficient water. A 25 per cent. solution would answer in most cases, as it will withstand a temperature of zero. A 50 per cent. solution will withstand a temperature of 30 degrees below zero.

Anti-Freezing Solutions.

From A. T. F., New York—Will you kindly advise me the latest and most satisfactory anti-freezing solution to keep the jacket from freezing?

Reply—Wood alcohol is probably the best and most satisfactory, all things considered. Use a 25 per cent. solution for anything down to zero temperature and a 40 per cent. solution for 24 degrees below zero. Calcium chloride and glycerine are also used, but either will be liable to injure the metal or the rubber hose connections.

Water In Gasoline.

The results of water in the gasoline tank are not always known. They are simply misfiring, more or less chronic and more or less pronounced, according to the degree of the dilution. Most motorists afflicted by this trouble are probably duped just as we were, and run through the whole gamut of tests. First we tested the cylinders individually, to find all were equally affected; then we spent a solid hour on the magneto, carbureter, and valves, all without finding anything amiss. Finally, in desperation we emptied the tank of some six gallons of freshly bought gasoline and poured in the spare can, when the engine immediately responded to the next pull of the handle, and ran like a clock. In our case there is no doubt one of the cans just bought had contained a very large percentage of water, possibly pure water. This trouble may afflict any motorist at any time, and since the only safe test for it is to empty the tank and refill with fresh gasoline, if any is available, it is obviously a trouble to avoid. There is only one certain method of avoiding it, and that is to carry one's own gasoline funnel perpetually on the car, and to test the gauze of the funnel to make sure it is fine enough to retain water. At first sight one would say that if there is water in the tank there will be sufficient token of its presence in the carbureter to assist diagnosis, but we have not found it so, and if the carbureter is periodically cleaned out, few motorists will look at it when misfiring occurs until a lot of time has already run to waste. Another precaution of a similar type is always to sniff the gasoline when it is poured in.

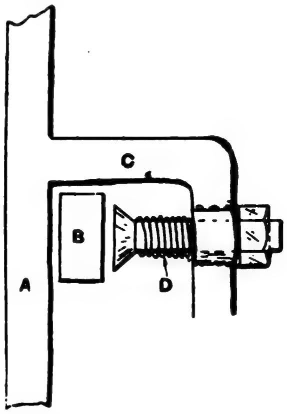
Remedy for Speed Loss.

In case of loss of power with magneto ignition, after all other remedies have failed try this: If the flat spring of the contact breaker be pushed aside, the brass cover slipped off, and the contact breaker detached, it will be

noticed that the arm has a heel shaped like a ball, and that it is this ball which is lifted by the projections on the fiber cam. This ball is only subject to very minute and gradual wear, since it is of hardened steel, and its friction is against softer substance, to wit, fiber. None the less it does wear in time, and the effect of wear upon it is obvious. Such wear reduces the distance by which the points separate, and retards the moment at which they separate.

Making the Speed Lever Safe.

In driving a car fitted with a plain straight-through gear quadrant, we found that the spring on the spindle axis of the gear lever was seldom in sufficiently good order to hold the lever in its notch. Sometimes the lever would



A, change speed lever
B, change speed quadrant
C, elbow piece welded on
D, spring and plunger

jump into the first gear when the car was stationary, and at other times it would jerk out of whatever notch it happened to be in while the car was moving. For a time we were content to try and improve matters by oiling and cleaning this spring and spindle, but this effected no permanent improvement, and necessitated removing the side flap of a fibre mud shield, which was not clean and inconvenient to handle. It finally appeared that this spring was not ideal in its location, as it was 9 inches below the quadrant on which it was supposed to exert its pressure, and that pressure was exerted through a right angle and not direct. Examination proved that the trouble was due to wear in the eye and pin attaching the vertical gear lever to the horizontal operating spindle. A little eyeletted arm was therefore forged on to the gear lever to carry a fibre-faced friction stud; this stud was held by a comparatively weak spring against the outside face of the quadrant, and it proved entirely efficient. The gear lever is as easily operated by hand as ever it was, but it has never since on any occasion evinced any disposition to wander from its appointed notch.

One Way of Starting.

Try this simple method of cranking to get the engine started: Take an ordinary dust cloth, a handkerchief can be made to do, make a ball out of one end and tuck this ball into the intake opening, leaving the loose end of the cloth remain outside. Give a couple of turns and jerk out the cloth the moment the engine starts.

Half the lost power of a badlv working engine is often due to leaky valves or to valves whose timing is out of adjustment. Test the cylinders, one at a time, and see if one is not taking its impulses in a sluggish, ineffective way, while the others are doing most of the work.

If the crank case becomes very hot and the engine weak it may be due to a leak of exploded gas by the piston rings, which may have become worn or broken, or there may be a crack in the head of the piston.

THE HOYT TRIUNE VOLTAMMETER.

This is a novel departure in measuring instruments, giving three instruments in one, the Voltmeter scale 0-10, the Ammeter scale 0-30, the Ammeter scale 0-1½.

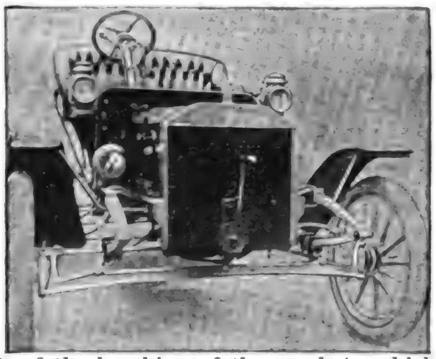
This instrument has been designed, the manufacturers say, expressly for that large and representative class who want only the best and are willing to pay a fair price for it. It is furnished in a morocco bound, plush lined case, having a separate compartment for a pair of silk covered cables which accompany it. Do not think, for a moment, that it is a cheap gauge. It is ruggedly built, finely finished, D'Arsonval type. The moving parts rest in highly polished jewel bearings, and the instrument is guaranteed accurate at all points on the scale. Live dealers everywhere are supposed to keep this instrument, or it will be sent, expressage paid. The advertisement of the company will be found on another page. If you want any further particulars, writ for Bulletin A. R. to the Hoyt Electrical Instrument Works, Penacook, N. H.

Miller's Tire Pressure Indicator.—Every experienced automobilist will probably admit that there would be a distinct advantage in knowing the exact pressure on each one of his tires. The tendency, of course, is to inflate one tire harder than another all the time, simply because of the difficulty of determining what the pressure is. Charles E. Miller, of Anderson, Ind., has invented a pressure indicator, which he says will easily show the exact pressure in pounds per square inch in any tire. Of course, by having the exact pressure the life of the tire can be greatly prolonged, and, therefore, one of these indicators is likely to save its cost many times every year. They are suposed to be sold by dealers everywhere, but in case your dealer hasn't them, Mr. Miller will send one postpaid on receipt of $2.50, and refund your money if you are not satisfied after you get it. He has a full line of vulcanizers, and would like to send his catalogue to any one interested. In writing him, or ordering, kindly mention the Automobile Dealer and Repairer.

SCHUMARD'S FRONT SPRING OUTFIT FOR FORD CARS.

While the Ford runabouts have had an immense sale, owing to their low cost, it is claimed that these machines have developed a weakness in the single front spring. On good roads this weakness is scarcely recognizable, but it comes out strongly, so it is claimed, where the roads are rough.

E. C. Schumard, who has had large experience in connection with Ford cars, has designed a full elliptic spring outfit for the Ford cars, which completely overcomes the defect referred to. The chief danger in connection with the front spring of the Ford is not so much the liability of the breakage of the spring, but rather the possibility



of the breaking of the perch to which the spring it attached. A break of this sort causes the frame to slip on the spring, which makes steering impossible and results in a wreck, whenever this sort of an accident happens.

The full elliptic spring outfit designed by Mr. Schumard not only eliminates this trouble but adds to the appearance of the car and improves its riding qualities. Hundreds of these outfits have already been sold. They are being marketed by the Special Motor Vehicle Company, Cincinnati, Ohio, whose announcement will be found in this issue, and who will be glad to furnish further particulars to any one who may be interested.

FOR SALE—Right to manufacture compound for brazing cast iron. Address Robert Gedye, New Castle, Ind.

BUICK MODEL 10 wanted; demonstration and perfect order required; price must be low. Doctor, Box 450, Waterbury, Conn.

FOR SALE—Two 20th century tire protectors, 32x4; guaranteed good as new. Price, $25. Cost new $56. N. L. Lee, Demopolis, Ala.

EXCHANGE—Orient Buckboard, Curtis Motorcycle, 10-inch lathe, new. Want runabout 7 h. p. or one needing repairs. H. N. Stackpole, Canoon. N. Y.

AUTOCAR 1906 touring car, 20 h. p. four-cylinder motor; new top and wind shield; fine condition; bargain. O. C. Snyder, Bethlehem, Pa.

FOR SALE—A two horsepower motor cycle engine with coil, carburetor, timer, spark plug and wire; run but little; price $25. Address E. H. Landeck, Freeport, Ill.

$2,200 FOUR-CYLINDER CADILLAC, $1,250; one cylinder, $375, $450, $600 and $700; guaranteed; two-cylinder Haynes, $150. Charles E. Woods, Portsmouth, N. H.

WANTED—I would like to hear from some one who has a set of 36x3 Turnbuckle steel, new or second hand, Dunlop Tires to sell for a Duryea car. Address F. G. Knott, Sprague, Wash.

"A BARGAIN EXTRAORDINARY"—$7.50, 6-volt, 60-ampere sparking battery. There with the juice. They are a well-known make and perfectly new goods. A rare chance to buy a $25 battery cheap. Special prices to dealers in quantities. S. Breakstone, 900 Fisher Bldg., Chicago, Ill.

FOR SALE—Five-passenger Rambler surrey; new engine and new tires; price, $400, or will exchange for machinery; also runabout, all complete, with top, ready for power; price, $200; pressed steel frame, 104-inch wheel base, $25; four-horse stationary gasoline engine $75. Address Central Supply Co., Richland, Pa.

FOR SALE—Two-cylinder, eight horsepower steam engine, gasoline burner, generator, jet valve, auxiliary pump, two lubricators, gasoline tank, air tank, water tank, all in perfect condition, $45. Address E. H. Landeck, Freeport, Ill.

FOR SALE—One ten horsepower air-cooled Logan engine, set of Timken axles, set 40-inch wheels with 1¾-inch side wire tires; almost all needed to make an automobile or truck. Address Levi Zumbrun, Brookville, Ohio.

Stanley runabout, 1907 model; seats two or four; nice running order, good top, gas generator, lamps and tools; reason for selling, want a larger steam car; will sell cheap for cash. Chas. M. Ames, Voluntown, Conn.

A NEW INVENTION SENT ON APPROVAL—It is a Clingtight storm apron made of waterproof material, with spiral springs that encircle the waist and ankles. Holds not only itself, but the blanket or robe under it firmly about you. Keeps out the wind and the water, and keeps the comfort in. Gives you perfect freedom for both hands and feet to manipulate levers and pedals on your auto. Just as comfortable for buggy riding. No buttons, no buckles, no straps. Can be put on or off in an instant, and can be folded into small space. Beebe-Elliott Co., Racine, Wis., mfrs. of Ke-pa-go-in Tires and Defender Tire Covers.

FOR SALE—Two-cylinder, 4x4, Holsman type motor, $60; one-cylinder, 4½x5½, air cooled, $35; two-cylinder Ford motor, 4x4, water cooled, $50; two-cylinder, 4½x5, motor, new, $90; two-cylinder, water cooled, 5x5, $75; one-cylinder box coil, $8; two-cylinder, $7; roller timers, $3; seven-inch gas lamps, $9; pair mica spark plugs, 45 cents; Sta-rite mica plugs, 70 cents; 32x3 wheels and tires, $20; axles, $5 to $20; hood radiators, $15; pressed steel frames, $12; bevel axles, $40 to $75; tonneau body, $15; good wheels, $15 a set; Sorm steering wheel, $10; sliding gear transmission, $35 to $65; planetary, $18 to $35. Get our catalogue of supplies; our prices are the cheapest. Auto Parts Co., 52 and 54 West Jackson Boulevard, Chicago, Ill.

$175 buys fine Grout light steam touring car; bargain. Room 206, Sims Hall, Syracuse, N. Y.

A CASH DEAL—30-35 h. p. Peerless touring car; can't tell it from new; cheap; $1,200. Write at once. A. Bland, care Bland-Mueller, 321 4th St., Milwaukee, Wis.

BARGAIN — 1907 Gale Roadster, cost $1,000; run about 1,000 miles; all complete; practically good as new. Price, $500. Also two good engine lathes cheap. Box 275, Burlington, Wis.

IMPROVE the winter months by having your car overhauled and painted. All work guaranteed. O. K. Wight Official Garage and Repair Shop, 33d and South Park Blvd., Chicago.

FOR SALE CHEAP—A 4 H. P. Orient Friction Drive Buckboard, in good running order, with two new tires. Joe Shaw, Columbus, Texas.

FORD RUNABOUT OWNERS—Modernize your car with Rumble seat and trunk, $15. Glass front, $12; 3-hinged folding hood, $8; roadster fenders with brass bound running board, $12. Discount to dealers. State your wants for catalogue. Auto Rebuilding Co., Chicago, Ill.

POPE-HARTFORD Model B, improved, at $350. Lock Box 323, Barre, Vt.

FOR SALE—Steam Automobiles; write for illustrated bargain list. F. W. Ofeldt & Sons, Nyack, N. Y.

REBUILD YOUR CAR into "Gentleman's Roadster." We make latest style hoods, radiators, tanks, fenders, "hood dashes," glass fronts, auto trunks, Rumble seats, etc.; 20% saved. Your old car re-designed free. Hood and Dash outfits for '03 and '04 Ford, Cadillac and Winton in stock. Smashed lamps and radiators repaired like new. State your needs for catalogue. Auto Rebuilding Co., Chicago, Ill.

SLIP NIT FOR AUTO CLUTCHES AND Motor Cycle Belts—Absolutely guaranteed to stop auto clutches and motor cycle belts from slipping. Price $1 per package. Wilson Garage, Berlin, Wis.

Wheels for Racing.

Editor AUTOMOBILE DEALER AND REPAIRER:

As so much seems to depend upon racing, and manufacturers are sparing neither expense nor study to make road racing cars that will make the highest speed, why do they not double the diameter of the wheels of racing cars? While this, of course, would present some difficulties of construction in order to secure the requisite strength, it must not be forgotten that wheels of such a size would go four times as far with one revolution, the tires would be far less liable to heat and burst, the engine need not be speeded more than one-eighth as fast, and I see no reason why far higher speed could not be attained than with the smaller wheels. What do the experts think of this?

RACER.

If you don't see what you want, ask for it.

WOODWORTH TREADS.—The Leather Tire Goods Company of Newton Upper Falls, Mass., has made quite a substantial reduction in the price of Woodworth Treads, taking effect October 20, last. At present, for illustration, the price of 28x3 tire of the regular tread is but $10, and that of the special tread for the same size but $12, and other prices have been reduced for all sizes in about the same proportion. The firm will be glad to send the full reduced price list with the code words for ordering by wire to all who may apply for it. It may be stated that the price list given is also subject to a discount of 5 per cent. for cash. These adjustable treads are too well known to need the slightest attempt at descripion or praise. They probably save about half the tire bill and positively prevent skidding.

THE SCHENECTADY AUTOMOBILE SCHOOL.—We understand that C. S. Mack, proprietor of the Schenectady Garage and Automobile School, 15 North College street, Schenectady, N. Y., has lately been enrolling a large number of students. The success of Mr. Mack's school comes, we understand, from the thorough instruction which he imparts and the entire satisfaction he gives to all students.

THE Empire Automobile Tire Company, Trenton, N. J., has appointed the

Consumers' Automobile Supply Company, Seventh avenue and Smithfield street, Pittsburg, Pa., agents for the sale of their goods. Those of our readers who may be conveniently situated should correspond with the Consumers' Automobile Supply Company.

Classified Buyers' Guide.

DEFENDER TIRE COVERS AND KE-PA-GO-IN TIRES.

We illustrate herewith the Defender Tire Cover, manufactured by the Beebe-Elliott Company, Racine, Wis. This cover is stated by the makers to be good for any old rubber tire that will hold air. It is made of Chrome leather, which is water-proofed. It is studded with steel rivets. This leather itself is hard to puncture and the added use of steel rivets makes the Defender an armor which is hard to pierce, bruise or injure by nails, thorns, stones, broken bottles, bones, etc., that may be strewn in the road. Leather covers will stretch, but in the

Defender provision has been made to take up the stretch. The same company manufactures the celebrated "Ke-Pa-Go-In" Tire, which is described as an absolutely puncture-proof yet fully resilient tire. This is a leather tire studded with rivets of steel, cold-drawn. Ke-Pa-Go-In Tires are unique in construction, as they are made in sections, and when a bad spot develops it can be removed and replaced with a new section, which is a great economy. As this armor cement and the small advertisement printed elsewhere may not appear but once, readers who are intersted are requested to write at once for explanatory literature, prices, etc., to the Beebe-Elliott Company, Racine, Wis. In writing please mention the AUTOMOBILE DEALER AND REPAIRER.

Index to Advertisers.

PARKS' SECRET PROCESS CEMENT

We wish to call the special attention of our readers to F. B. Parks' Rubber Cement for tire repairing. This cement contains absolutely no acids to corrode the rubber and, no matter where it is used, the manufacturers claim, and it is also attested by users that this cement outlasts the remainder of the tire or other object to which it is applied. For work on automobile tires this cement is particularly recommended. The hottest day in summer does not in the least affect the patch or plug put on with Parks' Cement. This cement was invented by F. B. Parks, of Grand Rapids, Mich., in 1902, and has given universal satisfaction for repairing auto tubes and cases. The formula is secret and defies analysis. It practically vulcanizes without heat. Over 350 garages are now regularly using this cement and would take no other. Read the following testimonials: A garage owner in Meriden, Conn., says: "I wish to congratulate you on the staying qualities of your cement. I have used your cement for the last two years and always found that the patch outlasted the tire." An auto repair man says: "Your cement is giving entire satisfaction, in fact, the only cement we have ever found that would do the work, and do it absolutely sure." So that readers may recognize this cement, we show with this

article a cut of one of the cans, showing exact appearance. To our readers who will respond promptly and mention this publication a sample can of the cement will be sent, express prepaid, on receipt of 50 cents. You are advised to avail yourselves of this generous introductory offer. Address F. B. Parks, 171 Prescott street, Grand Rapids, Mich., and mention the AUTOMOBILE DEALER AND REPAIRER.

A Threading Outfit

that is suitable for general shop use—the 'DUPLEX' BOLT DIE STOCK SET "A," range ¼ to ¾ in. It contains dies that adjust without a wrench, and require no reversing when cut is finished.

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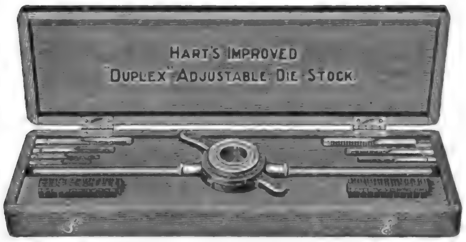

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Switches give current for—
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Provided With Bridges to
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Throw Switches Off and Prevent Unauthorized Parties Running Out Cars.

A. HALL BERRY, 97 Warren St., New York.

Automobile Dealer and Repairer

A PRACTICAL JOURNAL EXCLUSIVELY FOR THESE INTERESTS.

VOL. VI., NO. 4. NEW YORK, DECEMBER, 1908. PRICE { 10c. PER COPY / $1.00 PER YEAR

MISFIRES.

What Causes Them and How They Can Usually Be Remedied.

BY SYDNEY F. WALKER.

By misfires are meant, failures of the charge to ignite, and they may be confined to one cylinder of the engine, or be common to all of them. Misfires are unfortunately, very common in all engines working with either gas,

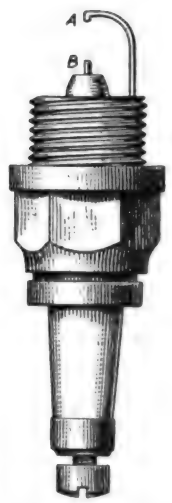

FIG. 1—The distance between the platinum points A and B is too great, a fat spark cannot pass and misfires will arise. The points should be very close.

petroleum, or gasoline. One appreciates this very forcibly, when one has to test an engine, using one of the above fuels. One perhaps obtains a very good indicator card, and at first sight, the engine appears to be doing remarkably well, occasionally it appears to be doing better than the makers designed it for, or than it ought to do, according to the sizes, and the result is apt to be a little puzzling, till one takes the trouble to count the explosions. It will be remembered, it is the explosion stroke only which counts. It is the explosion stroke which is the equivalent of each stroke of the steam engine, and if an engine misses an explosion, it loses that much power.

An engine running for instance, at 1,500 revolutions per minute, if it misses a few explosions now and then, the matter is not serious, but if it is a four-cylinder engine, and one of the cylinders is constantly missing, the loss of power may be very serious, particularly when the engine is called upon to perform heavy work, such as mounting a hill, or making up time.

Misfires are due principally to three causes, failure of ignition, improper mixture in the charge, and sticking of one of the valves. Failure of ignition is unfortunately one of the most frequent, and the writer would advise any automobile repairer, to suspect the ignition first, if a car is brought to him to be dealt with for misfire. The article, from the writer, printed in the July, August and September issues, will have given pretty full instruction for testing the ignition outfit.

It need only be stated here, that unless what is known as a "fat" spark is obtained, the ignition outfit should be thoroughly overhauled. If the spark is weak, if instead of having the solid body which gives the appearance that has been expressly termed "fat," it appears to have a difficulty in bridging the space between either the platinum points, or the make and brake arrangement, and will be almost sure to fail, if the charge is subject to a little increased compression, or if again the best mixture is not present. There is a certain range of mixture, that fires best, and if this is not present, if a little more, or a little less petrol is present, the weak spark may fail to ignite. The weak spark may be caused by the spark points being sooted up or being too far apart, and also by the insulation of the spark plug being damaged, or by the commutator not making proper contact. Figs. 1 and 2 illustrate these causes of failure.

TROUBLES WITH THE CARBURETTER.

The carburetter is unfortunately a very delicate apparatus. It is necessary to provide it with a gauze, to strain the gasoline, and to prevent substances getting in, that would clog the valve. The valve itself also through which the gasoline issues, to mix with the air on its way to the engine, is necessarily very small indeed, and

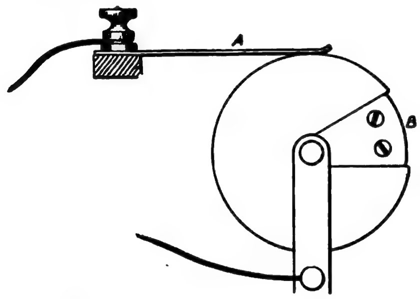

FIG. 2—If the metal hector B that is to make contact with the spring A at firing time is sunk below the periphery of the disk, as shown, contact will not be made. It is wiser for it to stand out a little.

is easily choked, as shown in Fig. 3. Further, the arrangements of most carburetters are somewhat liable to upset, without actually stopping the supply, the result being an improper mixture passing to the engine. Explosion can only take place, if the amount of gasoline present in the air, is between certain percentages, and the more nearly the percentage reaches the two limits, the more likelihood there is of misfire, particularly if the spark is weak. Too strong or too weak a charge of gasoline may lead to misfire with a weak spark. It is very difficult to give exact instructions for determining where and when something of the kind has happened. It is another of those cases where practical experience is of so much value. The man who is constantly handling carburetters, will come to know, almost by intuition,

when a carburetter is not doing its proper work, when it is not furnishing its proper mixture.

Another possible source of trouble, and unfortunately a somewhat common one, is, the difference in the quality, and the specific gravity of the gasoline employed. If carburetter is arranged for a gasoline of one specific gravity, it may not work properly, in the sense that it will not pass on the proper charge, with another specific gravity. Again this is another case where practical experience will come in. The man who is constantly handling carburetters, will come to know by the look and the touch of gasoline its specific gravity, and by the appearance of different forms of carburetters, their

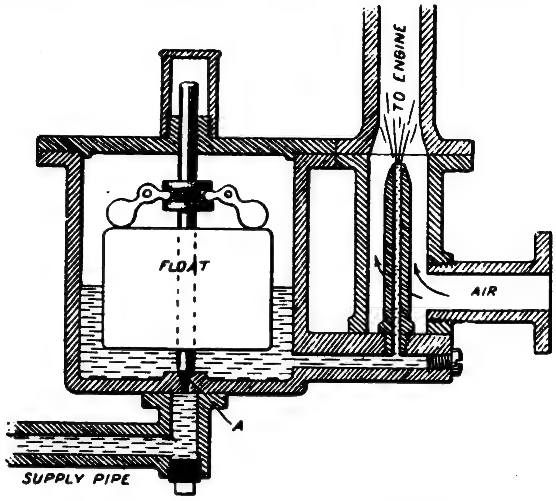

FIG. 3—The gasoline has to pass to the needle valve A, which is a very fine hole, and is easily closed.

adaptability for gasoline of different specific gravities, and how to adapt them to gasoline of a new specific gravity. Practical experience also will teach the carburetter man to look at once to the needle valve, the gauze, the float, and the different parts of the apparatus. One hint may be given. Where there are several cylinders to the engine, if one only misses fire, it will probably not be the carburetter, while if all miss fire, it very probably is.

VALVE STICKING.

Sticking valves are apt to give a great deal of trouble, that is sometimes difficult to find, because by the time the car is brought in for repair, the valve has settled down in its place again. If the exhaust valve sticks open, it is quite evident that no charge can remain in the cylinder, it is forced out on the compression stroke, and if the admission valve will not open, or will not open to the full extent, the full charge cannot pass in. There is only one rule of finding out if a sticking valve is the cause: If the ignition outfit is shown to be all in order, the spark "fat," the carburetter all in order, the valves should be carefully examined by hand, moved by hand, to see if there is any sign of sticking, and then the engine run under as severe conditions as can be arranged at the moment, and watched. Probably the valve will stick after a little time, if it has been doing so on the roads.

Preventing Creeping Tires.

A studded rear tire will creep sooner than a smooth one, because it does not slip so easily. If the tire shoe be old and well stretched the air pressure plus the ordinary bolts may not be sufficient to prevent creeping, and the inner tube may suffer in consequence. An effectual remedy for most cases is to supply one, or possibly two, extra bolts next to the valve. The valve itself does not help to hold the shoe against creeping, and the tire is consequently least secure at that point.

CYLINDER HEAT WASTE.

What the Cumbersome Water Jacket Is Responsible For.

BY JAMES F. HOBART. M.E.

Authorities are pretty well agreed that if the heat units contained in one pound of hydrocarbon consumed in an internal combustion engine be divided roughly into six parts, one of these parts will be transferred into useful work, three parts transferred to the jacket water, one part lost in the exhaust gas, and one part lost by conduction and radiation.

This means that 16 per cent. to 17 per cent. of the heat value of the gasoline is turned into useful work, and that 83 per cent. to 84 per cent. of the heat units are wasted. Although this may seem a great deal of waste, it is far more efficient than the external combustion engine. The efficiency of the best boilers is about 80 per cent., but this point is seldom or never reached in practice. The efficiency of the steam engine, when considered as a perfect heat engine, taking steam at 200 pounds gauge pressure, and condensing the exhaust; extracting every unit of heat down to 100° Fahr.,—the efficiency of such an engine, perfect, but impossible, would be about 34 per cent. of the heat value of the steam received from the boiler. Deduct the 20 per cent. of heat lost by the perfect but impossible boiler, and there is left an efficiency of 27 2-10 per cent. for the perfect steam engine.

How close the ordinary engine comes to this figure may be approximated when we consider that when steam at 200 pounds gauge pressure is exhausted at 212°, the efficiency is only 20 8-10 per cent. Deducting a boiler loss of 30 per cent. (10 per cent. more than highest possible results), there remains only 14 55-100 per cent. of efficiency, and if we deduct the usual heat loss of 16 per cent. by conduction and radiation, there will remain but about 12 2-10 per cent. of useful work from the heat units supplied by the fuel. Thus it will be seen that the steam engine labors under a greater disadvantage than the gasoline engine.

Of the 83 per cent. or 84 per cent. of heat which now is lost in the gasoline engine, it is evident that we can do nothing with the part lost by conduction and radiation, thus reducing our working capital to 66 per cent. of the heat units supplied to the engine. The ordinary temperature of exhaust is somewhere about 1300° Fahr. thermometer scale. Some authorities give the specific heat of exhaust as .26, and if the temperature of the external air is 70, there will be 1230° above atmospheric temperature, and the waste heat units will be 1230. x 26 = 319.8 or 319.8 x 778 = 248,804 foot pounds of energy to the pound of exhaust gas.

The amount of gas may be estimated for each particular motor by assuming a weight of .078 pounds for each cubic foot. If we assume a cylinder volume of 5" diameter by 5" stroke, the volume will be about 97 cubic inches (slide rule computation) or 97. + 1728 = .056 cubic foot, and .078 x .056 = .004375 pounds of gas to each exhaust puff. This means that there are .004375 x 248,804 = 1085. foot pounds of energy each exhaust discharge.

Allowing 60 explosions a minute, the power wasted in the exhaust of a single cylinder, 5" x 5" gasoline motor, would be 1085. x 60 = 60.510. foot pounds, or 1.97—almost two horse-power. But the greatest loss is in the water-jacket, where half the entire power is lost, or nearly six horse-power goes to the bad.

It is not possible at present to save the exhaust waste by any means known to engineers, but if it were possible

to expand the burnt gases down to the atmospheric line, there would be a considerable saving and a corresponding increase in efficiency, but the mechanical difficulties in the way of such an undertaking are too great to make the venture profitable where such small units are employed as in automobile construction and propulsion.

The waste units in the exhaust can be used for heating the interior of the vehicle by means of pipes placed underneath the seats and around the foot room, but only a very small fraction of the heat lost could be employed in that manner without broiling the occupants of the vehicle, so great is the amount of heat wasted. The jacket water would heat the carriage insufferably hot, with its 700 or more waste heat units each minute, therefore this method of waste heat utilization is not to be considered for a moment. What is wanted is some way of getting more of the gasoline heat units into useful work.

The temperature at which the jacket water comes from the cylinder will have much to do with the amount of heat wasted in that liquid. For example, suppose the water passed through the jacket at the rate of 8 pounds a minute, and was heated from 60° to 140° in passing through. To raise 8 pounds of water 80° requires 640 British thermal units, and as the difference between the average temperature inside the cylinder (about 1000°) and that of the jacket water (about 100°) is 900°, there will be about 711 heat units a minute, transmitted through the walls of the cylinder for each degree of difference between the inner and outer temperatures.

Now, reduce the flow of the jacket water to 4.78 pounds and as long as the average temperature inside the cylinder remains constant, the water will issue at a temperature of 190° Fahr. This means a rise of 130°, and to heat 4.78 pounds of water that number of degrees will require $4.78 \times 130 = 622$ heat units a minute, a saving of 18 heat units a minute, which means $\frac{18 \times 778}{33{,}000} = 4.23$ horse-power.

Thus, there is a chance to save some heat and to raise the efficiency of the engine by running less water through the cylinder jacket and using higher temperatures throughout. This means that the entire water-jacket business is a drag upon the engine and is a source of waste, from start to finish. This is the truth. The water-jacket is a source of loss, and *the* principal source of loss in gasoline engines. But we cannot dispense with the water-jacket, for we will quickly get into trouble should we try it; owing to the intense heat of the explosion, some 1500° to 3000°, the oil would be decomposed and without lubrication, the cylinder would soon be cut to pieces and the engine would refuse to run at all.

We must, therefore, permit water to pass through the jacket fast enough to keep the temperature of the cylinder down to a point where the cylinder oil will do its work. Usually the limit is about 200° for jacket water temperature, and beyond that point it is not safe to go without close attention and constant inspection of the cylinder to ascertain whether or not the oil is being decomposed. Oil which is decomposed ceases to lubricate. Then, beware of the consequences!

One pound of ordinary gasoline may contain about 11,000 B. T. U. We propose to get rid of one-half this amount of heat in the jacket water and for that purpose run pounds and pounds of cold water through the water-jacket, without deriving one bit of benefit from the heat thus carried away by the jacket water.

It now seems to be the problem to remove the heat from the cylinder at present carried away by the jacket water, by some other means, and at the same time to derive some benefit from the heat thus removed. Upwards of 15 years ago the writer saw gas engines commercially operated without a water-jacket, the excess cylinder heat being carried away by means of a spray of water injected directly into the combustion chamber at the proper time.

Of every pound of gasoline, carrying 11,000 heat units, 5500 must be removed from the cylinder by some means which will not permit the walls of the cylinder to become unduly heated. Water, at 70°, admitted at a temperature say of 1000° Fahr., will take up $1000 - 70 + 966 = 1896$ B. T. U., to the pound. Of this amount, 930 units will be taken up in raising the temperature of the water from 70° to 1000°, while 966 units will become latent during the act of turning the water into steam.

It will thus require $5500 + 1896 = 2.9$ pounds of water injected into the cylinder to absorb the stated quantity of heat from one pound of gasoline. Practically three times as much water as gasoline, and should it become possible to operate automobile engines in this manner, two and one-tenth gallons of water will be placed in tanks for every gallon of gasoline that is taken along.

There is doubtless quite a problem connected with the use of water in this manner, and the problem is one which deserves to be thoroughly worked out by gas-engine engineers. The writer has had no opportunity to collect data concerning this method of withdrawing the excess of heat from the internal combustion cylinder. The engines in operation noted above were not so situated that they could be tested, hence the lack of data concerning their performance.

In working out the method above proposed, it should be the aim of the engineer to derive a good deal of benefit from the presence of water in the cylinder, and not merely to withdraw the excess of heat. Unless some energy is derived from the injected water, there is no benefit to be derived from the proposed innovation, and we might as well stick to the cumbersome care-requiring water-jacket, radiator and its accompanying ills. But there must be derived some returns from the water in the cylinder besides absorbing heat.

In making a mixture of air and gasoline, it is required that not more than 95 to 100 B. T. U. or its equivalent of gasoline, be contained in each cubic foot of air mixture supplied to the engine. The proportion is found as follows: Assuming that in a gas engine, one cubic foot of gas, containing the equivalent of 660 B. T. U., must be mixed with 6 cubic feet of air, the resulting mixture will be 7 cubic feet containing 660 B. T. U., or 94.3 B. T. U., to the cubic foot. As one pound of gasoline is supposed to contain 11,000 B. T. U., to put in 94.3, we must take $94.3 + 11{,}000 = .00856$ pounds of gasoline. The 5″ x 5″ cylinder contains .056 cubic foot, therefore there would be in one cylinder full of explosive mixture, $.00856 \times .056 = .00047936$ pounds of gasoline, and three times that amount, or .001738 pound of water—about 28-1000 of an ounce.

This amount of water suddenly flashed into steam some time after the explosion, say at ¼ of the power stroke, would become steam under a gauge pressure of about 150 pounds added to whatever increase in pressure was caused by the increase of volume when the given quantity of water went into steam.

Steam under a pressure of about 165 pounds, absolute, occupies 2.72 cubic feet to the pound of water. Then the volume occupied by the water injected, after it has been turned into steam at 150 pounds gauge pressure, will be $.001738 \times 2.72 = .00472736$ cubic foot, or about 81 cubic inches.

The volume of the cylinder, or that part swept through by the piston has been stated to be about 97 cubic inches,

and one-fourth of this has been swept through when the injected water is turned into steam. The clearance volume of the cylinder must be added to the volume swept through by the piston at the time the water is turned loose. Estimating the clearance volume as two-thirds the cylinder volume, or about 32 cubic inches, the entire volume of gas at the time the injected water acts is about $32 + \frac{97}{4} = 56$ cubic inches, nearly.

The effect of adding a volume of 81 inches of vapor at 150 pounds gauge pressure, to 56 cubic inches of gas under the same pressure, cannot but force the pressure up a considerable amount. In fact were the volume to remain constant, the pressure would increase somewhere in the ratio of $150 \times \frac{81 + 56}{56} = 368$ pounds. An arrangement of this kind would result in doubling the efficiency of the gas engine and instead of having an efficiency of about 16 per cent. or 17 per cent., as at present, it would stand to the world as utilizing more than 34 per cent. of the thermal value of the gasoline.

Some engineers may have already worked along these lines, and have found some mortal objection to the proposition. However this may be, the writer has thus far, through very limited work in that direction, found nothing objectionable more than the necessity for the invention of methods of introducing the required amount of water at the proper instant, and the determination of that instant of time or of cycle.

The steam engine had its efficiency nearly doubled by George H. Corliss when that gentleman invented the Corliss valve gear. Is it not worth a good deal of engineering study to double the efficiency of the gasoline engine, and at the same time to get rid of the cumbersome and undesirable water-jacket? It seems to the writer as though the possible results are worth every effort that can be put forth in that direction.

To Save Running Expenses.

Filter all gasoline through regular filter paper. A piece of dirt may mean a $40 repair job.

Use plenty of oil. Insufficient oil means wear of bearings and a "drag" on your engine.

Filter all your water. Same reason as in No. 1 above.

Tighten all nuts once or twice a week for obvious reasons.

Anything wrong, stop and find trouble at once and correct it. You soon become accustomed to normal sounds when running.

Engine runs jerky or irregular, clean your spark plugs and see that your coil is working properly. Throw spark plug away when worn out. It is cheaper than wearing out your engine.

Engine refuses to run, the usual cause is something broken at one of the valves, unless due to spark plug or coil trouble. This is an important point to remember.

As soon as you have a flat tire repair it, unless you wish to purchase a new inner tube.

When the thermometer is below 32 degrees F. use anti-freezing mixture or you will order a new pump.

To protect your tires and avoid accidents, use steel-studded leather casings or similar devices in wet and winter weather.

When a mysterious loss of power occurs with a car that has seen some use, do not omit an examination of the exhaust box. A foul exhaust outlet makes a very efficient power absorber.

THE NEW ENGINE.

Some Recent Opinions of the Knight Valveless Pattern.

At the recent Olympia automobile show in London, the Knight valveless or slide valve engine, taken up by the Daimler Company, was the subject of much discussion, as it has been for weeks among automobile manufacturers and engineers all over England, France and Germany. Mr. Knight has the experience of successful experiments in this country to point to, as well as the drastic tests carried out by the Daimler Company, and he can also adduce the fact that the Panhard and Mercedes firms are keenly interested in the new motor, which by its silence and flexible running, promises popularity. On the other hand, all the makers of engines with valves of the ordinary kind are up in arms, and stoutly maintain the excellence of their well-tried systems. There are many superb specimens of both types of engine, and it is largely a matter of individual taste in deciding between them. But the new system is bound eventually to have a strong influence on engine design.

The six-cylinder motor has grown in importance since the arrival of the Knight sleeve valve engine, and thus all the leading makers of poppet valve engines have brought their six-cylinder motors to a very high pitch of efficiency. Increased attention is also given to other valveless engines, which dispense with the usual valves in a manner that differs from the Knight idea. The combined effect of these inventions will be to further stimulate effort in improving the gasoline engine, and thus rendering it capable of doing good work whether running fast or slow.

The criticism and remarks of engineers and rivals abroad have in the main been fair, and have largely consisted in rebutting the statements of Mr. Knight with regard to the noisiness, unreliability and general untrustworthiness of the engines and cars now in use. Mr. Knight has been given much to the habit of contrasting the advantages of his own engine with the disadvantages—not of the best of others, but of the ordinary or inferior. It must be admitted that to say that on the up-to-date car continuous noise is mistaken for silence, or that the tremor of the valves is felt all through the car, is not true so far as it concerns the best cars with the ordinary engines. Some critics are content to compare the behavior of six-cylinder cars with his, but many four-cylinder engines would not be improved much if they were rendered any quieter than they are now. The critics also were perfectly right in denying that broken valves are of common occurrence; indeed, so seldom does a valve break that very few motorists carry spare ones on their cars unless on tour. But the best criticism came from the man who insisted that nowadays the weakest points of automobiles lie chiefly behind the engine, and that there, too, lie the causes of most of the noises, that, however, only give pedestrians just enough time to get out of the way. That is where we are looking for improvement, in the abolition of that unmechanical gear box, the intricate differential, and the treacherous tire, and though Mr. Knight and the Daimler Company have improved upon modern engines, yet they have but painted the lily and gilded refined gold in comparison with what they might have done if they had brought out an invention for changing speed by pressing a button, or a tire that was as easy as a pneumatic and would never go wrong. But even if they, or anyone else, did this, motorists would forbear to welcome it as perfect until it had been proved by time, distance, and under the rough hands of ordinary (not expert) drivers.

THE DEALER

SELLING AUTOMOBILES.

Why Dealers Should Understand Details and How Manufacturers Want Their Product Marketed.

(From an address by Hon. A. L. Walch of Minerva. Ia.)

The enormous sale of automobiles in Iowa the past year is enough to awaken any dealer to ask himself if he shall try to get a portion of that business or not, and this is what I am going to outline from my experience in that business. At our convention last year, I was of the opinion that nothing could stop the coming automobile business, and it was coming fast. To-day I can say with still more confidence that we have seen but its infancy, and that inside of ten years this will be one of the greatest lines of business to contend with; 1st, the great magnitude of its sales and capital involved, 2nd, the sufficient mechanical knowledge required to succeed or fail.

DEALERS SHOULD UNDERSTAND DETAILS.

Now for the dealer, and who shall or best can sell and take care of this large and fast coming business. Our motto, "To the retail dealer belongs the retail trade." In this we must be consistent, and unless we fully understand every detail of the automobile business we must go easy and not rely on our motto too strongly. Every car, when it comes from the factory, is tested out, and almost always ready to start right off, and I have found less troubles and defects in automobiles than in any other lines of machinery. But with the dealer who sells the car rests the responsibility of keeping it there until his customer becomes sufficiently instructed so as to be able to help himself. You all know how hard you found the gas engine business when you depended on factory experts, and in this business when it is "pay cash and then help yourself." So my advice would be to thoroughly acquaint yourself before you venture heavily. Some 3,500 cars were sold in Iowa this last year. Probably twice that number will be sold in 1909. The farmer will be the principal buyer, as he started well this last season, and they have the money.

CONDITIONS OF CONTRACTS.

Now let's see what the manufacturer of automobiles thinks of us as suitable means to market their product. I spent several days in Chicago recently, and find the manufacturers of standard lines of cars to be very independent, and in several instances find their 1909 output already sold, in which case we can expect them to be independent. However, I found that the tendency of many of these manufacturers is to market their product through the machine dealer, but this is the contract most of them try to get. They like to give only limited territory, and want to tie you down to 5 cars to every 2,000 population in territory you ask to get contract in; you pay $50 down on runabouts, and $100 down on touring cars, balance on delivery; no sample cars furnished. This, indeed, does not look very good for the dealer, and I think that if the manufacturers insist on this kind of a contract they will soon see their mistake. It would shut off local dealers and compel them to retail their own product, which they all try to get away from. The early contracts for 1909 look to me about like this: You get as little territory and commission as they can possibly squeeze out of you; they retain the best portion and a clause in contract whereby they can sell anywhere. The above applies principally to those who term themselves manufacturers of the standard lines of cars.

OTHER MANUFACTURERS.

But, dealers, let's see what the other manufacturers of cars are doing, the large number who are fighting for business. Many of them build as good cars as those that term themselves the standard lines. Remember that there are no royalties or patents whereby any single manufacturer has a great advantage on the business. The name on any automobile does not stand for quality any longer. These manufacturers of cars will give you territory and respect your rights, and it would be my judgment that we owe them our figures before we close any contract, and by encouraging these large numbers of manufacturers we can best hope to put this business in the hands of local machine dealers, and be able to realize a nice profit, and quote our motto, "To the retail dealer belongs the retail trade."

The automobile brings progressive ideas, better roads and is a factor of prosperity. The progressive ideas that this new line brings is not to be scoffed at. It will stimulate your business, bring a lot of new trade; hence, more profits. The automobile, when introduced, will fight for better roads, a question that sadly needs attention, both in work and the way the work is done. Being directly interested in the highway you can rest assured their presence will improve these conditions. We have passed the age of prejudice against the auto, which instead is welcomed in most all places. Those State legislatures which were so anxious to pass drastic laws to curb this fast coming business, are falling over themselves in an effort to repeal same and give room for this new factor that has come to stay. Business men and farmers alike have come to realize that eighty millions of dollars spent annually in the manufacture of automobiles brings prosperity. To curb this large and growing industry would throw out of employment a hundred thousand men, lower the price of all farm product, with a tendency to cause a national calamity.

Side Pull of Brakes.

Many brake shoes acting on the rear wheels are subject to more or less side pull, owing to the tension rods not acting in a straight fore and aft line. This results in wearing the shoes and drums sidewise and giving rise before long to objectionable play and rattle. Frequently, it is possible to attach a small guiding bracket to the stationary support in such a manner as to take the lateral component of the brake rods' pull and compel the brake shoes to keep their normal position. The same thing applies occasionally to the running brake, whose tension rod does not always run exactly straight.

The new motoring regulations at Paris empower the police to suspend the license of a driver for from eight to sixty days for infractions, and from two to twelve months for injuring a person.

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ADVERTISING RATES MADE KNOWN ON APPLICATION.

NEW YORK, DECEMBER, 1908.

Missing Numbers—Our readers are requested to remember that it always gives us pleasure to re-send numbers which have gone astray in the mails.

THE TARIFF ON AUTOMOBILES.

If the tariff of 45 per cent. on imported automobiles is "for revenue only" then it is rather too high, and the importers are justified in trying to secure a reduction. But if it is to foster and protect a great American industry then the duty had best remain as it is at present.

The claim of the importers that automobile manufacturing in this country is in the hands of a trust and that there is no competition in prices, is so manifestly absurd that it scarcely calls for a reply. No business exists where the competition is sharper than in the manufacture of automobiles. There are over 250 firms engaged in it and each firm is trying by every means in its power to sell as many cars as possible. The profit on the sale of low-priced cars is extremely small, and while that on the high-priced cars is greater, the sales are few numerically and the cost of making a sale runs into the hundreds of dollars in almost every case.

As to the uncertainties of the business, of the 51 firms in the manufacturing business in 1902 but 21 survive to-day, and from 1902 to 1906, 155 firms discontinued.

There is not the slightest doubt that each manufacturer whether he belongs to an association or not is unrestrained and free to regulate his own prices and where the competition is so sharp it goes without saying that he must fix them as low as possible in every instance.

This publication is not run in the interest of the manufacturer, but for the dealer, the repair man and the private owner. But under present conditions it is for the interest of the American people to purchase American cars. They are better adapted to our service and our highways than foreign cars, and they are as cheap in price as they can be made by American workmen at the American rate of wages, while they are as serviceable as they can be made by American skill. No purchaser should ask for greater advantages than these, and none need take less.

Meantime, those who take a fancy to foreign cars can get them by paying the price plus the duty. They are worth what they cost, while as for the American car it is about the cheapest thing at the price that can be purchased and it will be a long time before anything of equal value can be purchased for less.

COST OF RUNNING.

In some cases but little information is gained by giving tables of the expense of the cost of running cars. The sum total depends almost altogether upon the man who owns or drives the car. The man who looks after his own car, or at any rate, is capable of doing so, very rarely complains of the high cost of the up-keep, while in nearly every case, the one who employs a half qualified chauffeur has reason to do so, and usually exercises that reason.

It is difficult to convince many owners of cars that it is true economy to employ a really good man who is something more than a mere driver, and who naturally requires payment in accordance with his ability. The car owner thinks he is economizing by getting a cheap and incompetent man, but what he saves in wages is lost by his ignorance and perhaps by his dishonesty. This is especially the case when the owner himself does not know enough to see that his car is properly looked after and driven. It does not take long to run up a big bill of costs if the brakes are used violently, the clutch with equal brutality, and the tires carelessly or ignorantly, and the same may be said of careless lubrication and adjustments.

But what is the use of having a good man if he is not given the opportunity of attending to the car? Car owners should not forget that no matter how clever a driver may be, he can do nothing if the car is required for use every day and all day.

Then again, in estimating the cost of running a car with that of horse driving, it is usually forgotten that the mileage is often quadrupled and sometime multiplied by ten. Furthermore, in addition to using a car most imprudently, a big and powerful one is often sent upon the most trivial errand for which a bicycle would be far more suitable and infinitely less costly.

Thus in making estimates of the cost of running cars, every detail should be given—the kind of roads, the size and make of the car, and who runs it as well as how.

THE TREATMENT.

Those who have awakened to the necessity of an abatement of automobile accidents should be reminded that simply acknowledgement and condemnation of the evil are now belated perceptions. The case was diagnosed by this magazine long ago; the thing to do now is to apply the remedy.

But not all car owners or drivers need treatment, by any means, nor are car owners and drivers the only members of the public that need it.

It is about time that pedestrians were taught the lesson—to change the metaphor—that the streets and public highways are not loafing and gossip grounds, and that children should be kept by their parents from using them as playgrounds. In crossing the street or road many pedestrians seem to invite being run over. They cross whenever and wherever an uncurbed fancy seems to dictate, and it is rare, indeed, that they look more than one way to see if a car is approaching. The time will come when there will be a law forbidding pedestrians from crossing either a street or a highway except at certain designated points.

Drivers of horses must be taught that they have their duties as well as their rights. They are restricted in the use of the highways by the corresponding rights of

all others, including pedestrians and drivers of automobiles.

Finally car drivers must be taught that the least infringement of the rights of other users of the highways, arising from its power and speed, is unlawful, and will receive swift and severe punishment.

As to the regulation of speed, the law will finally be the same in one State that it is in another, of course, and limits will not be fixed at a certain number of miles an hour, but at a rate that is reasonable and proper with regard to other users of the highways.

With such laws, and with punishment for violation that "fits the crime," automobile accidents will finally be extremely rare, for when controlled by an intelligent and prudent driver, the automobile is the least dangerous of all vehicles.

HORSE POWER AND SPEED.

There is food for thought in the fact that at the recent Savannah races, the car that won the grand prize was a 120 horse power Fiat and the speed was 65½ miles an hour, while the car that won the race for the light car division was a Hol-Tan 12-18 horse power and the speed was a fraction less than 52 miles an hour.

This would seem to indicate that high speed does not depend wholly upon high horse power. In other words, increasing the horse power 800 per cent. increases the speed but about 20 per cent.

But what matters it whether a car will go 65 miles an hour or only 50 miles an hour? No car would be allowed to go at either speeds upon the public highways, and even though it were none but the most foolhardy or reckless would care to ride faster than one-half the slower speed.

Moreover, racing cars are much like racing yachts, altogether useless for practical use. Of course, in the case of racing cars this does not apply, but stock cars do not win races in these track events. It is, of course, possible to build a car of coarse and crude workmanship that will ignore all the rules of scientific automobile practice and, by equipping it with sufficient power, attain a speed of something like a mile in 36 seconds on a smooth straightaway track. But such a performance proves nothing; and the car would be absolutely worthless for practical purposes. The car which runs at terrific speed over a smooth surface is not tested as to its internal mechanism to any extent, because it meets no obstruction, other than wind-pressure, and suffers little strain.

Purely as a sport track automobile racing has its interest and excitement, but as a test of the practical value of the machines it is of far less use than horse racing is of value to horse breeding.

GEAR OR CHAIN DRIVE.

A matter of importance, and one that is worthy of discussion in an unprejudiced spirit, is the question as to which transmission gives the greatest all-round satisfaction—chain drive or live axle and propeller-shaft? We know that it is not a new topic, having been under discussion from the early days of the motor car, yet a few opinions might be of service to the motoring world. The relative merits of the respective systems in a good many opinions are practically equal; the live axle has the advantage, of course, of sweet and silent running, cleanliness, and—if well designed—immunity from trouble; the loss of power due to the action of the universal joints can be reduced to a very small percentage, which may be considered a strong point where efficiency is mainly considered. The tire up-keep must, of course, be recognized as a strong enemy of the live axle. The claims of the votaries of chain transmission are often largely based on this point, while easy replacement of a chain as compared with the dismantling of the propeller-shaft is a strong point in its favor. The unpleasant rattle so often inseparable from the chain drive may, of course, be overcome by easing and running in oil, pleasant examples of which are already appearing.

In the matter of friction, the loss of power is greater in the gear than in the chain; not so much where the power applied is little, as for instance on the level, but in the case of a heavy load up an incline, the gears have a tendency to fly apart, to spring away from each other, so to speak. Nothing of the kind occurs in the case of the chain. In other words, in the case of the gear the friction increases in greater volume than the increase of the power applied, while in case of the chain it increases only as the power applied increases.

DUST RAISING.

It is well-known that, given a sufficient clearance between the lowest part of the car mechanism and the road little dust is raised, even when traveling at fair speeds. Designers usually object to diminishing the stability of the car by raising the centre of gravity. This course does not seem to be well founded. A higher centre of gravity would tend to educate chauffeurs to drive with even greater care round corners, and would certainly increase the percentage of accidents among "road hogs." The centre of gravity may be raised considerably without danger with careful driving.

Moreover, scores of accidents have occurred because the mechanism of the car was near to the ground and hit some obstruction when if a foot higher it would have been easily cleared.

The car of the future will have higher wheels and much greater road clearance, thus modifying dust raising and preventing at all events more accidents than it will invite from the liability of overturning.

An automobile is subjected to about five times more severe use than a horse-drawn vehicle. This is due not only to the far greater speed to which it is put, but likewise to the fact that it carries its own power of propulsion. Suppose a horse-drawn vehicle had to carry the horse as well as the passengers and likewise were driven on occasions at five times its present speed? How long would it last?

In some 9,345 cases the press has stated that E. R. Thomas, the well-known capitalist, was to be expelled from the New Jersey Automobile and Motor Club, for violating the organization's rules and the State laws by speeding, and in some 9,346 cases it has been stated that he has been expelled. The ayes seem to have it; the ayes have it, and Mr. Thomas is duly expelled.

King Edward crossed the famous Grampian Hills in Scotland from Balmoral to Blairgowrie in an automobile, climbing 2,200 feet and traveling 44 miles in less than two hours.

An esteemed contemporary uses nearly a page of its valuable space to tell how to avoid skidding. We can give the information in rather less space, namely: Go slow.

LESSONS FOR DRIVERS.

Carelessness and Ignorance Responsible for Most Accidents.

It is of course to be assumed that when a trolley car stops at a crossing or elsewhere it is to either take passengers on or let them off, and that a passenger is liable at any time to alight from a trolley car when not in motion and even when the car is in motion, for that matter. These being the facts, it would seem that an automobile driver would use a little care in passing a trolley car. But judging from the reports of accidents due to a failure to exercise this ordinary prudence, such is not always the case.

A Lack of Prudence.

Near New Haven, Conn., recently, a man about 35 years old started to get off a trolly car, but before he had time to get away an automobile came along and struck him with considerable force and he was thrown to the street. The driver stopped the car at once and returned to the scene of the accident where the man was found in a dying condition. The owner of the car is prominent in Connecticut public affairs and is one of the State Presidential Electors, but he can under no circumstances plead extenuation for the tragedy.

As He Stepped From the Car.

As a man stepped from a trolley car in Plainfield, N. J., he was struck by an automobile and disemboweled. As is becoming so common, the chauffeur fled, but he was afterward arrested and has been charged with murder.

Struck a Low Culvert.

While driving near Burlington, Vt., a low culvert was struck in the gutter and before the car could be controlled, the occupants were thrown out, one being instantly killed and the two others seriously injured.

Skidded Into a Fire Hydrant.

In Los Angeles, Cal., a car skidded on the wet pavement, struck a fire hydrant, broke the plug, turned on the water, came near killing the occupants of the car, flooded the streets, drenched the crowd, and damaged the car to the extent of $300.

An Open Draw.

A woman and a man were drowned and six companions were rescued from a like fate after an automobile in which they were riding had run into an open draw in Chicago, Ill., recently. The car was speeding along in the darkness not knowing, or caring, it is safe to say, as to what was ahead. Early in the evening the party had stopped at saloons "and taken several drinks." The driver saw the open draw just before the car reached it, but it was too late to stop the car.

A Tire Exploded.

One man was killed and six others injured up town in New York the other day when a car was thrown against a telegraph pole by the explosion of a tire. The car was going at a dangerous rate of speed, as might be supposed.

Ran Over a Dog.

Two women had a narrow escape from death near Trenton, N. J., when their car ran over a Newfoundland dog and upset. They were thrown into the ditch and both suffered serious though not fatal injury.

To Avoid a Train.

When a car was within 40 feet of a railroad junction a train suddenly appeared and there was nothing to do but ditch the car or suffer a more terrible accident. It was hurled over an eight-foot embankment and six persons were injured, two of them dangerously.

Cut Down in a Manhole.

A repair man in the employ of the Southern New England Telephone Company was cut down in a manhole in New Haven. The unfortunate victim had lain down on his stomach partly in the manhole when the car came along in the darkness and rain. He was horribly crushed and the woman occupants of the car fainted when they learned of the full extent of the accident.

Car Ran Backwards.

Near Allentown, Pa., when half way up a hill a car stuck and soon began to run backwards. The brakes did not work properly and the machine ran by the side of an embankment and upset. The two occupants were seriously injured and the car is pretty well ruined.

Steering Gear Breaks.

In Washington, D. C., while a party of riders were going at a good speed the steering gear broke, the car swerved, struck a rise in the road, turned over and killed the chauffeur. The rest of the party were more fortunate and escaped with little injury. It should be stated that the night was cold and the riders had stopped at road houses to warm up.

A Raised Umbrella.

Dr. David D. Thompson, of Evanston, Ill., editor of the *Northwestern Christian Advocate,* died from the effects of an automobile accident. The night was rainy and Dr. Thompson was carrying a raised umbrella as he stepped in front of the machine that struck him.

He Avoided the Dog.

In Savannah, Ga., the driver of a car turned slightly to avoid a dog which was crossing the road. Owing to great speed the car swerved sidewise and struck a tree. It turned completely over and was made a total wreck. The two occupants were not seriously injured.

Guesses He Fell Asleep.

In Toronto, Canada, while a party was driving late at night the car swerved and crashed into a curb, and four people were badly hurt. The driver and owner of the car acknowledges that there is little left of it, but he says he has not the slightest idea how the accident could have happened, but "I guess I must have fallen asleep," he added.

Cranking Dangers.

The Fidelity and Casualty Company, of New York, say their records show that out of the first 107 claims paid to automobile owners as result of accidents in or about their machines, that fifty of these accidents were due directly to cranking. Of the fifty, twelve resulted in fractured bones, one in the dislocation and the other thirty-seven in sprains, bruises and lacerations of varying severity. These 107 cases were taken just as they came in their records and are typical of their present experience in this connection. The following appears in the casualty notes of the Western Underwriters July 30: "The Travelers during the year paid over $20,500 to policy holders who were injured while cranking autos.

Total number of injured, 225. These injuries involved a total loss of business time over 304 weeks and partial business time of over 582 weeks."

Accident companies' experience shows conclusively that the bones of the arm are not always broken, as is usually supposed, by the crank being thrown back after the hand has released its hold and by hitting the arm, but instead the fracture is frequently created in the following manner:

A person while cranking a gas engine has his strength concentrated at the wrist. The explosion continues the moment in the direction intended. The fracture known as the "Collis" ensues by reason of a strong acceleration of motion, causes a sharp increase in the strain on the bent joint and often the "Radius" and "Ulna" bones are the first to snap. The absence of any bruise, which is so often the case, shows clearly that in the majority of fractures the hand does not leave the crank.

THE RAKE OFF.

How It Is Accomplished in Divers Ways by the Unscrupulous Chauffeur.

It is becoming generally known among owners of motor vehicles that the man in charge of the car occasionally gets a rake off on repair work and purchase of supplies. The average owner does not care to enter into all the little details of cost of operation of the car. Knowing this, unscrupulous chauffeurs take advantage of the

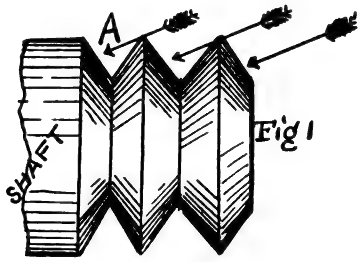


Fig 1

situation and turn a part of the proceeds of repairs and gasoline and tire supplies into their own pockets. This is a great annoyance to honest repairmen and some have undertaken to avoid the rake off system by sending bills direct to the owners of the machines. The result is that the chauffeur may go elsewhere next time there is a job to be done or some gasoline to buy. Possibly not more than 25 per cent. of the chauffeurs strive to make money this way. But this is enough to create endless complica-

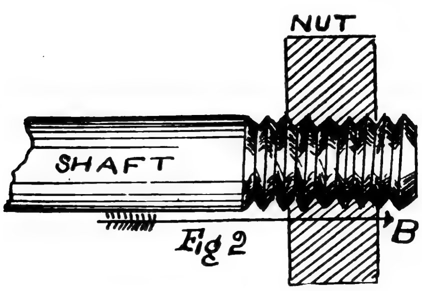


Fig 2

tions for the garage keepers and repairmen. If the rake off comes out of the bill direct, then the money paid to the chauffeur is ont of the pocket of the repairman. If the repairman demands full value for his work or supplies, then the rake off must come by a false bill or statement, to which is added the required rake off.

In this case the car owner may in some way discover that the charges for repair work and supplies excels running values and an investigation may result, injuring the business of the repairman and causing the chauffeur to be fired. Such things have happened.

In one instance a chauffeur confessed that for a year he earned a rake off almost equalling his pay. The owner of the car was a wealthy manufacturer who had no time to investigate. The chauffeur simply drew up the accounts at the end of each month and received a check with which to settle all bills. Bills of various sorts

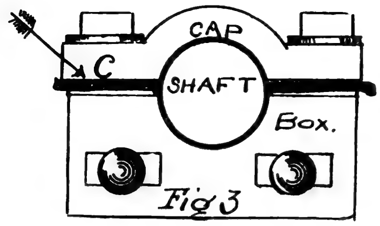


Fig 3

were rendered for articles of repair never obtained. Extra tires were purchased and resold. Gasoline was palmed off to ready buyers at reduced rates. Imaginary jobs wers done to the car. This ran on for over a year, until the owner finally comprehended what was going on and the man was discharged. He finally obtained a position

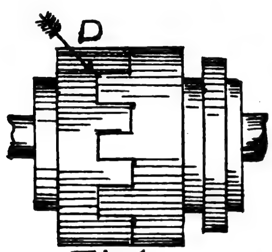


Fig 4

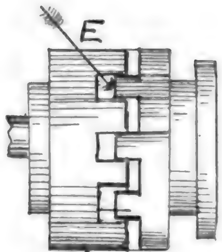


Fig 5

with another party but here the gasoline was measured out and kept locked. The owner also possessed a tool chest and did much tinkering himself. He refused to let the chauffeur run the car into the repair shop unless he, the owner, went there too. Rakes off were not forthcoming in this case.

And so it goes. Some men have no time to keep tabs on the bills for running the car and get imposed upon. Others watch financial transactions very closely and only honest work is done.

We exhibit a few cuts to illustrate the point we have in mind. An acquantance of mine of doubtful character, but well trained as a chauffeur, ingeniously invented smash ups to get a rake off on the repair job.

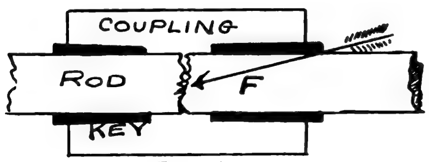


Fig 6

The car did not break down enough to make the rake off business active enough to suit. Knowing the law of the slanting threads of the fastening nuts of bolts, he simply loosened such nuts as would work free due to the vibrations of the car. The loosened nut would press on the threads as at A, Fig. 1, resulting in the inclined surfaces forcing the nut forward and off in the line of the arrow B, Fig. 2. The start could be made with the machine in order. After running a few miles the nut would drop off and a stop would be made at some repair shop. The repairing would be done and the wily chauffeur get his tip providing he was on the inside. He could have fixed the job himself and he could tell the

repairman so. But he wanted to encourage the repairmen and not take the bread out of their mouths. Of course the repair folks would appreciate all this and hand out a cigar. The enterprising chauffeur would see to it that something was handed out unless the boss watched too closely.

In another case, an ex-chauffeur told me that he has got a rake off of $4 on a new car by simply putting some pieces of metal beneath one of the caps of the clutch shaft as at C, Fig. 3. The elevated cap permitted the shaft to rock and wabble. The shaft was pronounced

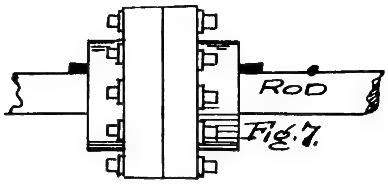


Fig. 7.

sprung and the car left at the shop for repairs. As soon as the owner took a carriage home, the chauffeur discovered the trouble and turned it off by directing the repairman to clean the box and repack it. The bill was $1.50. The chauffeur altered the bill to $15.00 for straightening a sprung shaft, got the money and pocketed the difference.

Another man moved out his clutch so that it could not get a firm grip as at D, Fig. 4, but only the points of the teeth contacted as at E, Fig. 5. Of course the teeth of the clutched commenced slipping and grinding in the first mile out. The chauffeur stopped at a repair shop, pronounced the clutch worn, and got a new one, saying he would put it on himself at home. The owner of the car praised the chauffeur. The chauffeur sold the clutch and restored the original to order by simply moving it back to its former position and the owner still believes the chauffeur a darling.

But the downfall of the chauffeur occurred when he used his ingenuity to piece up a brake rod with a keyed coupling as at F, Fig. 6. A new rod would have cost but a few dollars. The chauffeur pretended he obtained a new one and charged up the cost. Instead he patched the old one with the coupling as shown and the keys slipped one day and the car bumped a wagon and the boss got angry and fired the chauffeur. This reminds me of a flanged coupling which a party installed as in Fig. 7. The finely fitted flanges were strong enough, but the keys pulled out.

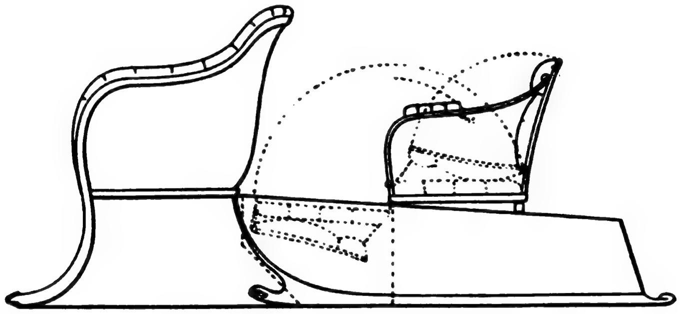
Why Drivers Do Not Slow Down.

Much car driving of a dangerous kind is due to the spirit infused into the driver by the knowledge that unless he keeps up his speed he must change to a lower gear; most drivers change to a higher gear with pleasure and drop to a lower one with regret and sometimes with disgust. This is due to the fact that the car is running at its quietest and smoothest on the higher gear or on the direct drive. If a car could be controlled from dead stop to full speed on level or on a hill without changing gear, and without the constant fear that if the engine be stopped then it must be started by hand again, few would be tempted to exceed moderate speed limits, and they would fall into the habit of driving more quietly in crowded streets.

If the car can run as quietly and smoothly when crawling behind a loaded wagon as when at full speed, the impatient haste to dart ahead on the first opportunity would be greatly modified. That apparently feverish desire for speed which has so roused the public is, in most cases, a desire for quiet running; and if designers could produce a car capable of running with quietness and certainty at all speeds, they would greatly assist the movement towards gentler driving. In advocating greater flexibility of engine the important point is in providing only moderate power at the high-speed running on the level, and modifying so as to make it possible to greatly increase mean pressure within the cylinder at the lower speeds of rotation. This would give ample torque for hill-climbing, and yet limit the power available for use while running on the level.

A Seat for Runabouts.

There has been introduced abroad a new folding seat for runabouts which is simple, practical and useful. As may be seen by the illustration as shown by the dotted lines, it can be turned forward when not in use and thus be quite invisible. It requires but little space and can almost instantly be made ready for use. The cover of the top of the platform or body is upholstered on the inside, and when turned back or opened it forms the



AN EXTRA SEAT FOR A RUNABOUT.

cushion of the seat. The back is fixed to the seat board, but folds down on the cushion when not in use. The arm rests are made below as hooks, as shown by the dotted lines, and are hooked in above; they are bound with solid bolts. This system of folding seat gives a good appearance to the automobile, and in some cases is extremely convenient. It can be easily made, and will soon be introduced in this country.

A Clean Muffler.

The mufflers of gasoline cars become more or less coated on the interior with particles of carbon bound together with burned oil, and this not only insulates the walls so that the dissipation of heat is retarded, but in aggravated cases has been known to obstruct and choke the passages, and thereby seriously interfere with the proper working of the engine, sometimes causing a mysterious loss of power. A well-designed muffler is one that can be easily taken down and apart for the purpose of cleaning out. The carbon and oil deposits stick tenaciously to the inside and washing out by ordinary means cannot be depended upon to clean them out, though in some cases it has proved helpful.

Valve Springs.

Spare exhaust valve springs should be carried on the car, being first compressed in a vice, and tied up in compression with strong twine to facilitate fitting. Where automatic inlet valves are employed the springs may be tested both against each other and against the spares by pressing the tips of the stems of the valves against each other and noticing whether both valves leave their seating together; but a finer adjustment may be procured by gripping the valve seatings in the vise and laying weights on the tops of the stems, noticing the exact weight required to depress each valve against its spring.

THE REPAIR SHOP

AUTOMOBILE REPAIRS.

What Responsibility Does Putting a Car In "Good Running Condition" Imply?

In Brooklyn, N. Y., recently, an action was brought in the City Court to recover the sum of $267.12, representing three items, first, the item of $160, the agreed price of certain repairs to defendant's electric automobile; secondly, the price of $78.12, the cost, as per agreement of the parties, of placing in the defendant's automobile a new armature; and thirdly, the item of $29, representing certain work, labor and services performed by the plaintiff, a repair man, upon the same automobile at the defendant's request. In making his decision the judge said:

"I find great difficulty in reaching a decision in this case, realizing that if I decide the issues in favor of the defendant the plaintiff must suffer a considerable loss, in view of the fact that it has expended time and money in the repairs which it undertook to make upon this automobile. But, on the other hand, if I decide in plaintiff's favor, the defendant would be put to great expense with comparatively little, if any, gain by reason of the work which the plaintiff undertook.

"I think it may fairly be said that it was the understanding between the parties that by reason of the repairs which the plaintiff undertook to do the automobile of the defendant was to be put in first class running condition, or at least in good running condition. As I understand it, this does not necessarily mean that it should be put in perfect mechanical condition. The question is, however, can it fairly be said that this automobile was by reason of the repairs which the plaintiff made put in good running condition? Admittedly, while the automobile was in the possession of the plaintiff, the only test of its running qualities was made about the garage floor. Besides this the automobile was operated only from the garage to the pier in New York and from the pier to the garage in Huntington, N. Y., a distance of but a few miles, over good roads, and after that the car could not be, and was not, operated satisfactorily. It is undisputed that when the attempt was made to recharge the batteries, which had in part been exhausted by the trip to Huntington, it was found that there was an interrupted circuit in the shape of the breaking of certain metal straps connecting the cells of the batteries. While this in itself may not have been a matter of very great importance, and a repair which could be made, it indicates to my mind that the work was not done in that workmanlike manner which the defendant had a right to expect.

"I take it that a car is not put in first class or in good running condition merely because it happens to run a few miles. There must be at least some reasonable period of time, when, with fair and reasonable usage, under ordinary conditions, the car should continue to be capable of operation. In this instance such was not the case. I do not mean to decide that the party undertaking repairs of an automobile guarantees the duration of those repairs, but where, as here, without any hard usage, and with only a few miles of operation, the car is found unfit for further operation, I do not think it can be said that the plaintiff has reasonably complied with its contract to put the car in first class or even in good running condition. So far, therefore, as the item of $160, the contract work, is concerned, I have concluded that the plaintiff must fail in its recovery.

"In regard to the items representing the labor of the plaintiff's employees in attempting to make the repairs in Huntington I do not think the plaintiff is entitled to recover, for they were mere attempts to remedy the defective condition of the car. So far as the price of the armature is concerned, I believe that it is but fair to permit the plaintiff to recover the cost thereof, as this armature was purchased by the plaintiff for the defendant, at the defendant's request, and was put into the defendant's car, and the defendant undoubtedly received the benefit thereof.

"It follows from these expressions of my opinion that judgment must be for the plaintiff in the sum of $78.12."

TIRE ALIGNMENT.

How to Detect and Remedy a Grave Defect.

From time to time we have referred to the importance of keeping the wheels in line, as any absence of alignment results in rapid wear of the tires, besides wasting power and affecting the steering of the car. Of course, the degree of needless wear to the tire, the amount of power wasted, and the effect upon the steering are proportionate to the inaccuracy of the wheels. There is no

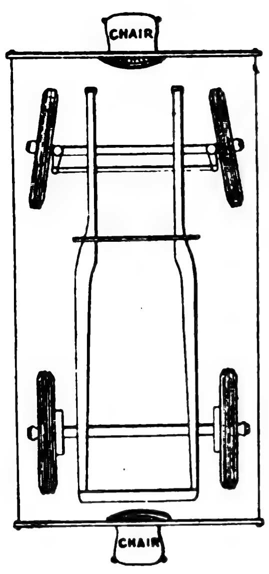


FIG 1.

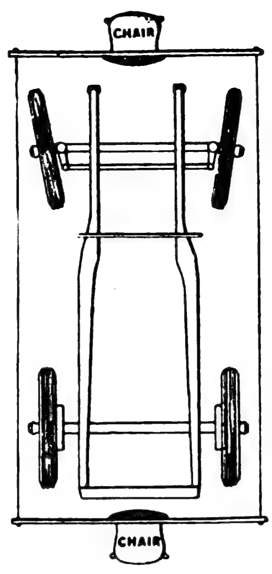


FIG. 2.

such thing as absolutely correct alignment, but something very nearly approximating to it must be obtained, and retained, if the tires are not to be unnecessarily worn away.

In the course of their very long experience as tire makers the Palmer Tire Co. have seen so much needless damage done to tires that they have made a study of the subject. They have found many instances of undue wear to tires for which the users not unnaturally blamed them were really due to the wheels of the car being out of line, so that the tires were dragged over the road, instead of being rolled along it. The makers of the Palmer tire

recognize quite well that the average owner has not the necessary appliances or staff for easily testing alignment, and therefore they have devised what for want of a better term we may call a one man method of ascertaining whether the wheels are all in line, and that without the necessity for any but the very simplest appliances. Two strips of wood, each about 7 feet long, should be procured. Holes should be drilled near the ends exactly the same distance apart, and the two strips of wood should be connected by two equal lengths of string, about 15 feet long. An ordinary chair is then placed in front of the car and another at the back, and the strips of wood are arranged across the chairs, and adjusted so that one of the strings is exactly parallel with one of the rear wheels. Whether it is parallel or not is ascertained by measuring the distance between the string and the rim of the wheel at opposite sides of its circumference. The other rear wheel should then be exactly parallel with the other string. If it is not it means that the rear axle is bent, the wheels out of truth, or the axle has shifted along the springs, or in the case of a chain-driven car it has been unequally adjusted. Having ascertained the parallelism of the rear wheels, one of the steering wheels should be set so that it, too, is parallel with the string, the string, of course, on that

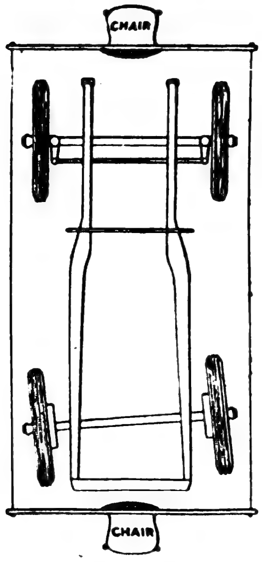


FIG 3.

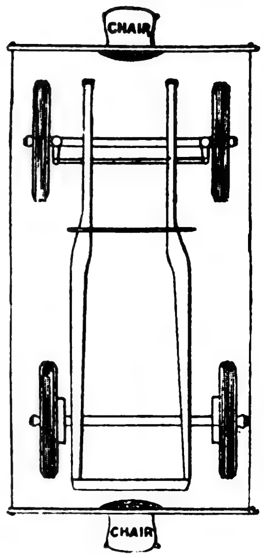


FIG. 4.

side remaining parallel with the back wheel. Having done this, the steering wheel on the other side should be found in correct alignment also. As the rims are not always quite true, it is advisable to move the car sufficiently to cause the wheels to make a quarter of a revolution, and then to repeat the whole of the measurements. If any marked discrepency is found, the truth or otherwise of the rim can at once be ascertained by jacking up the car and spinning the wheel.

It will be seen that this simple method of testing the alignment cannot fail, because the two strings are parallel with each other, as the holes in the strips of wood are exactly the same distance apart. Therefore, as the two strings are parallel, it follows that if one string is adjusted to be parallel with one of the driving wheels, and the steering wheel on the same side is also set parallel with the string, the two wheels on the other side must be parallel with their string, and if they are not the wheels are out of alignment, and the defect should be remedied. It should be borne in mind that occasionally the front wheels are rather closer together than the back. That is to say, the track in front is slightly narrower than the track at the back. This, of course, can easily be allowed for in making the measurements.

Figs. 1 to 4 show the errors in alignment which are most common. Each of the figures is a plan view, and Fig. 1 shows the common defect of the connecting rod being too long. That is, if it is placed behind the axle; if in front it is, of course, too short. Fig. 2 shows the same defect in the opposite direction, and the cause is due to bad fitting after manufacture, or to the rod which connects the two wheels having been bent in some way. The error shown in Fig. 3 is most common on chain-driven cars, and is due to careless chain adjustment, so that one end of the axle has been pulled back further than the other. It is also occasionally present in gear-driven cars, and caused by careless adjustment of the radius rods if radius rod adjustment is provided, or it may be due to the axle moving in the spring clamps, though, of course, in properly constructed cars such a movement is impossible. Fig. 4 only occurs when a car has been carelessly erected or has been in some serious collision or subjected to some extraordinary strain, so that the frame itself has bent or the axles have moved bodily sidewise in the spring clamps. It is most unlikely such a defect would pass any but a criminally careless manufacturer, and it is rarely found except when a car has been in some accident.

By far the most common defects are those shown in Figs. 1 and 2, and they are so common that it almost seems as though the coupling rod between the two wheels should be made adjustable. It is made adjustable in one or two cases. When it is not, the only remedy is to have it very carefully heated and bent by a good smith, the greatest care being taken that the ends or eyes are not set out of their proper position in any way, otherwise they will bind badly upon the steering pins. When any difficulties arise in finding out just where the lack of alignment lies, it can generally be ascertained by measuring and comparing the distances between the centres of the back and front wheels on each side of the car, and also by measuring the distances between the wheel rims and the frame.

As to the rear wheels, unless the frame is bent it is usually easy to set them right by means of the radius rods, but, of course, in the case of a defect like Fig. 4, and assuming that the axles themselves were all properly positioned on their springs, the only possible remedy would be to have the car dismantled and the frame trued by a firm of competent motor engineers. The Palmer Tire Co., advise all owners of cars to test their wheels in this way from time to time, and even to test new cars when received, as they tell us they know of cases in which new cars have been found to exhibit the defect shown in Figs. 1 and 2 in a marked way, so that directly they were put into use they commenced to scrape away their front tires.

Causes of a Missing Motor.

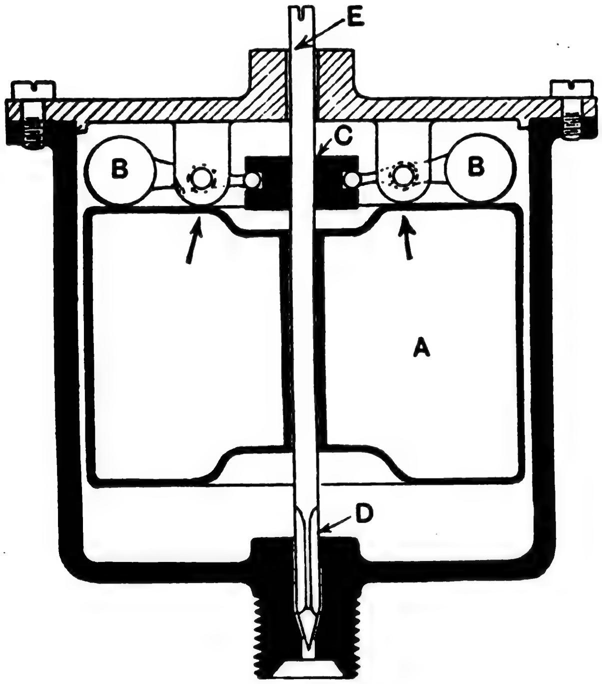
If a motor gets in the habit of missing a little when nothing seems wrong, it is well to look for a clogged muffler (which causes back pressure), weak valve springs, insufficient clearance between valve and tappet rod, leaky valves, leaky inlet pipe, weak batteries, vibrator points worn off, spark coil broken down in the insulation, insufficient time of contact in the commutator or badly worn valve gear. Leaky valves can easily be found by trying the compression with the inlet and exhaust pipes detached. If the inlet pipe leaks the motor will start hard and will require carburetter priming, and when the throttle is open the engine will choke and emit black smoke from the muffler.

Leaking Carburetter Floats.

Frequently car drivers have trouble with carburetters owing to the leaking of the float. The cause of this may be that this rather delicate part of the car's anatomy is not treated in a manner conducive to its well being. There is on the top of the carburetter a pin for depressing the float to obtain an excess of gasoline when such is required for starting the engine easily. In most cases the reason why the float springs a leak is because this pin is used too roughly and vigorously.

If the carburetter needs flooding nothing can be gained by giving the pin a jab, so to speak. Each blow you give it takes effect directly upon the float, and in time the severe usage can have but one effect, and that is to make it leak. If the pin be merely depressed with the float, and held for a few seconds, it will cause just as much gasoline if not more, to enter the float chamber in a given space of time, than if jabbed.

A few years ago the writer purchased a second hand car. When first used the carburetter persistently flooded when the engine was standing with the gasoline turned on and not running. The usual cure was tried of gently



grinding the needle valve into the seat, but this seemed to make matters worse if anything. An examination of the float found it perfectly gasoline tight and sound. Then the jet was raised considerably by fitting a washer under it, but this did not produce the desired effect. Finally it was discovered that not only was the float polished and rubbed where the toggles made contact with it in operation, but there were distinct signs that it had also been touching the projecting pieces, on the lid of the float chamber to which the toggles are attached. A sketch is given of the arrangement. You will notice that at the points indicated by the arrows is shown the float touching the projecting arms on the lid (when correctly set there should be a space of about a quarter of an inch, and, of course, the immediate effect of this would be to prevent the float A from rising any further, and if—as shown in the sketch, and was actually occurring in the case mentioned—the needle valve is still open, flooding must ensue.

The cause of this defect may have been one of two things—either the needle valve D had been ground in repeatedly, and so had worn the two seatings away very much, or else the position of the sleeve C may have been altered on the spindle E at some time or other. The defect was remedied by unsoldering the sleeve and refixing it an eighth of an inch higher, or farther away from the point of the needle valve. This had the effect of making the valve close earlier in relation to the upward movement of the float.

DETAILED EFFECT.

Things the Successful Automobile Painter Cannot Afford to Ignore.

BY M. C. HILLICK.

The automobile painter, while of course working always with a view of obtaining the best possible general effect, must, nevertheless, give strict heed to effects in detail.

Competition and the fierce rivalry among craftsmen for superior results emphasizes to an extent perhaps not otherwise possible the necessity of making this feature conspicuous.

Certainly at this time indications are all in favor of greater attention being paid to the display of detailed effects upon automobile surfaces for the coming season than ever before.

The jobbing shop painters, to many of whom The Automobile Dealer and Repairer pays a monthly visit have substantial reasons, therefore, for making the apparently minor matters of the general system of painting and finishing, of large concern.

And by way of suggestions along this line let us refer first to the varnish coats. There are many little refinements in slicking up the edges, and brushing away tokens of coarseness across the face of possibly inconspicuous panels and parts, which contribute enormously, if attended to, to the effects desired. Excellence in varnishing does not consist, as premier workmen will promise you, in merely developing a fine show over those parts of the surface most in evidence. Remote places upon the automobile given the perfect finish, furnish characteristics of luxury not to be ignored.

In the treatment and disposition of colors upon the surface there is urgent call for attention to detailed effects. At this point in the process of painting, as a matter of fact, the real crisis in the destiny of the surface is reached. Color possibilities and combinations, and the limitations to which they are subject, must here be duly and with expert knowledge considered.

There is wide latitude for improvement in the choice of color or colors for the automobile. This matter of choice depends in large part upon the size and general outlines of the automobile. As for example, surfaces of regular or even of angular outlines appear to greatest advantage clothed in brilliant colors, while surfaces of opposite formation—works of art, indeed, in their grace of curves and lines—invite the application of less glowing pigments. Upon all such surfaces the dark and beautiful greens and blues and maroons and grays are most effectively used. However, it is the detailed effects, the commonly unpretentions essentials easily passed over, in which we are chiefly interested at this time. Many colors are disfigured past redemption through unskillful application, or through final touches of the brush following application.

Some blues and nearly all the green pigments refuse to suffer cross brushing at the ends of panels. Even grays, colors which are ordinarily deemed beyond injury in this respect, are to be witnessed in their most pleasing

appearance when brushed only in one way. In fact, cross brushing of colors at surface ends, or anywhere else, should not be practiced nor tolerated. The inside surfaces of automobile bodies are often given a mere lick-and-a-promise finish just sufficient, seemingly, to enable the painter to escape criticism prior to getting the vehicle out of the shop, whereas such parts deserve to be brought up honestly with enough body of paint and color and varnish to give them a permanent finish. No class of automobile painting repairs should be taken to do at such a low figure as to prohibit the painter from doing the work in a proper manner. Reaction and loss of business are natural sequence of slighting and skimping the work to meet the price.

Striping and ornamental work has in the main, been restricted to the office of enriching the surface color, in which capacity it is used to a comparatively limited extent. But in this field, as elsewhere, detailed effects, quite as much as general effects, are to be sought for. The nicety of lines, accuracy of structure, harmony of color, and their location upon the surface with respect to the advantage conferred upon the entire color structure, are some of the effects in detail which the painter cannot afford to ignore.

Cleaning Varnished Parts.

Water and water alone should be used in cleaning the mud from the body of cars, and there should be no rubbing whatever except to get it dry after the mud has all been washed off. A continuous but not too powerful stream from a hose is the best possible method of attaining the desired end, and if this source of supply is not available the water should be thrown from a bucket. Having wiped off the water, the surface should be carefully dried with a soft chamois leather.

How important it is to refrain from rubbing the body even with a sponge while it is covered with mud or dust, may be gathered from the fact that the technical method of taking off varnish is to rub it all over with the finest pumice powder applied on a felt pad. This grinds away the surface without scoring it, but dust and mud are often so coarse-grained that they scratch the paint as well as dull the varnish unless most carefully removed. The practice of finger-marking dust-covered cars is particularly detrimental, because the pattern may be found to have been indelibly traced on the surface even after the car has been cleaned.

If there is occasion to give the varnish any polish, do not use anything with oil in it. Most of the so-called polishers contain oil and leave the surface sticky and in condition to catch the dust, so that the surface will look worse after having been once used than if nothing whatever had been applied.

Clutches and Their Use.

Clutches cause less damage to the transmission gear and go wrong in fewer instances than would be expected rather than more instances. But this is largely due to the excellence of the material of the modern car and the intelligence of most car drivers. When we consider the number of tons of energy which may be stored up in the moving parts of an engine, and the large resisting mass of a heavy car, it is surprising that unduly rapid dropping in of the clutch by a careless driver does not more frequently result in serious damage. The clutch is, however, undoubtedly responsible for much of the wear of motor mechanism.

Possibly it may be practical or possible to design a pneumatic clutch connecting the engine and the driven shaft, so that no violent shocks could reach the transmitting mechanism. Such a clutch might consist essentially of two or more cylinders mounted on the end of a driven shaft and rotating with it, and a crank on the end of the engine shaft connected to two or more pistons working in the rotating cylinders. The pistons would compress the air in the cylinders until the necessary driving torque was communicated to the driven shaft, when pistons and cylinders would rotate without further relative movement. To declutch it it would only be necessary to open a valve controlling the cylinders, when the engine would be at once freed from the car. Such a contrivance should be adjustable to apply any desired torque without shock. No severe starting shock could reach the transmission gear because of the elastic air connection. Of course there is nothing novel in this proposal. Many of the older motor vehicle patents, published long before the advent of the gasoline motor, suggest means of interposing an elastic air driving connection between the engine and the road wheels. This plan has not yet succeeded in practice; but if such a thing could be economically produced, it would undoubtedly greatly diminish the wear and tear suffered by motor vehicle mechanism. It would be interesting to learn of experiments on such an air clutch.

Special Spanners.

As a rule it is better to buy spanners than to make them, although some car drivers of a mechanical turn of mind prefer making to buying. Some cars seem to have been built regardless of accessibility, and it is only by the use of box spanners of from 12 to 18 inches in length that some of the parts can be adjusted with any degree of comfort or precision. The method of making spanners is as follows: First procure a length of cold drawn weldless steel tube, the internal diameter of which is slightly less than the total width of the nut—measured across the points of the hexagon—it is to ultimately fit over. The next thing to do is to heat one end of the tube and "draw" or "expand" it by hammer-it over a mandril until the diameter has been sufficiently increased to allow it to just catch on the corners. A second heating of the tubing will then enable it to be driven down over the nut to about a third of its depth. By turning the nut over on its side with the tube the latter can be made to conform to the shape of the nut by hammering each side alternately, at the same time causing the tube to expand more and more at each operation. By repeating the heating of the tube once or twice and the operation of first driving it down vertically over the nut and then shaping up with the nut on one side a very good job can be made. Both ends of the tube can, of course, be formed into box spanners if necessary, and in such a case an ordinary adjustable jaw spanner will serve to turn the box spanner; otherwise holes must be drilled in the tube.

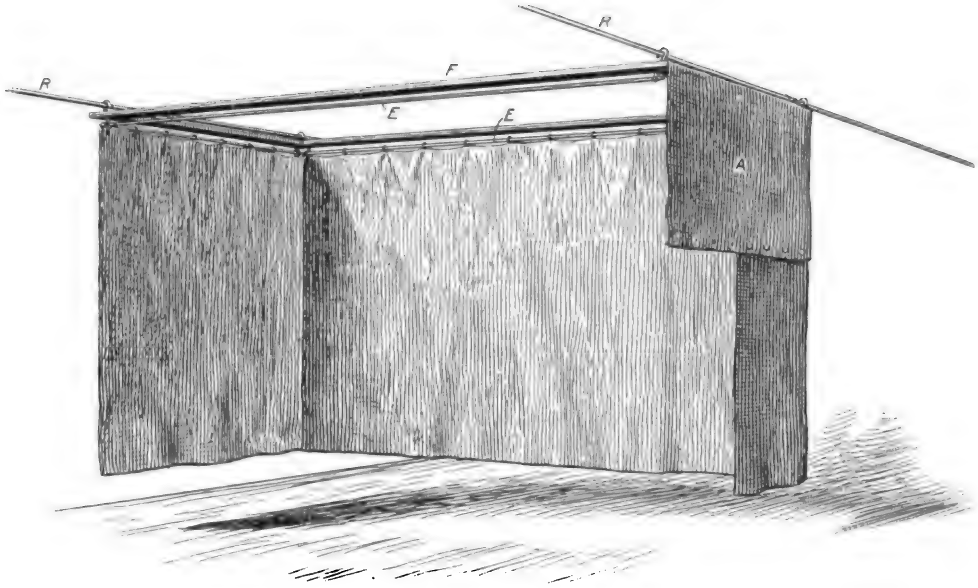
Cleaning Car Bodies.

Cars which are constantly driven in town and seldom in the country should be washed as rapidly as possible at the end of the day's journey, because the mud collected from the town roads contains impurities which are far more likely to damage the varnish work than ordinary mud which is collected from country roads. It is almost superfluous to say that buckets of water should be thrown over the body before a sponge or leather comes near it, otherwise the highly varnished body will be scratched by minute particles of grit, which will cut like diamonds. In winter great care should be taken to prevent the water freezing on the paintwork, as it is liable to crack the varnished surface and cause it to peel.

A Car Cover.

To Keep the Machine Free From Dust in the Garage.

A car cover which may be used by a single individual, without liability of dragging on the ground or floor of the garage, is illustrated herewith. It is made as follows: Two light steel ropes, RR, are fixed the length of the garage or place where the car is kept, and these are made taut with straining hooks at one end. A very light wooden frame, F, is then made just a little larger than the size of the car and is suspended from the steel ropes by four hooks, thus allowing the frame to travel the length of the garage. This is covered with cloth, which is allowed to extend over the sides and back of the frame and hang down far enough to cover the space between the frame and the side curtains. When the car is driven backward into the garage, the cover can be immediately pushed exactly over it with the aid of a stick. On the under side of the frame light iron rods, EE, are fixed on the two sides and the back, so that the back piece of the cover, which is fitted with rings at the top, can be suspended from the rod and is easily detachable for cleaning at any time. The sides are made like curtains, fitted also with rings at the top, and when unfastened from the front piece A, can be pushed up against the back wall of the coach house. They are buttoned to the back piece of the cover, and are made sufficiently wide to extend around the bonnet of the car, and be buttoned to the flap A, which is fixed to the front side of the traveling frame. This flap is brought down low enough for a man to button on the extensions of the side curtains, as shown, without using any steps. The cost of makng a cover of this description is something like $40, but nothing can better answer the purpose for a cover, and it can be put on and taken off instantly.



A Car Cover

Our illustration shows the car cover constructively rather than pictorially. The top covering of the frame, with its overhanging part, has been omitted so as to show the rods, which carry the curtains at the sides and back.

The fact that the constant vibration of the car will loosen, open or shake off anything that is capable of being jarred out of place should not be overlooked. Cocks and taps should always be carefully watched, for if they are not tight they will surely jar open.

Spark Plug and Its Buzzing.

If the engine fails to work regularly, first ascertain if your spark is all right by taking out the spark plug and placing the metal of the plug on the metal of the engine with the wire connected to the plug. Then (with your switch on) turn your engine over slowly until you see a spark between points on the plug. If your vibrator works and you fail to get a spark, your plug is short circuited, in which case you had better put in a clean plug and have the old one cleaned and repaired. If your vibrator does not work, then you will probably find a loose connection (or broken one) in your battery box. If your vibrator works freely your batteries may be weak or your coil needs adjusting. Turn the screw one way or the other until you get the best sound at the buzzer. This should be between a sharp and a very coarse buzz. A too coarse buzz will cause missing on high speed and a too light buzz will refuse to work and quit on you at times when most wanted. It will also have a tendency to burn the platinum points on the adjusting screw and on the vibrator. If your coil needs frequent adjusting, then your batteries are becoming weak and should be replaced. The points on the plug should be at least 1-32 of an inch apart for best results, although you might not notice any difference until your batteries begin to get weak.

For Rusted Springs.

If the springs have become very much rusted through lack of care the only cure is to take them down and remove the rust. This will necessitate jacking up the frame and supporting it while the spring shackles are released and the running gear detached. The springs will then have to be dismounted, each individual leaf cleaned with emery cloth, well lubricated with grease and remounted. Do one spring at a time so that the leaves, bolts, etc., may not become mixed. Even in modern cars entirely insufficient facilities are provided for lubricating the leaves of suspension springs.

Clutch Lubrication.

For the lubrication of plate clutches, it is claimed that two tablespoonfuls of soft soap dissolved thoroughly in half a pint of boiling water is better than any oil and prevents glazing. Soft soap is cheap but whether it fills the requirements claimed for it can best be determined after a trial.

HOW TO TIE KNOTS.

Things Every Car Driver, Repair Man and Mechanic Should Know.

No apology is necessary for publishing in an automobile magazine information showing how to tie knots that will not slip or jam and that can be readily untied when necessary, or how to splice a rope. These are good things to know when a car must be towed to the garage, or when something happens far away from the repair shop, necessitating the use of rope and knots that will

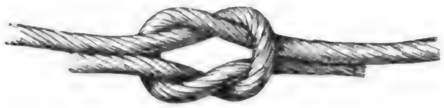


Fig. 1—The square knot left open to show the turns of the rope.

absolutely secure it. To make a short splice in a rope or the most secure of all hitches is just as essential to the car driver as it is to the sailor, the machinist or the farmer.

The bundle of rope which one finds coiled about every post or tree where an attempt is made to sling a hammock is enough to make angels weep and sailor men break one of the ten commandments.

The prime requisite of a knot or hitch is that it shall not slip under any conditions of strain, and a most important feature is that it shall not "jam," which means that the parts shall not interlock themselves so firmly that the knot cannot be untied. It is just as important

Fig. 2—The bowline knot.

when a knot has been tied to have it easily untied as it is to make a secure fastening in the first place.

In attempting to fasten two pieces of rope together, most people make what the sailor calls a "granny" knot. This knot has all the faults possible for a knot. It slips as soon as a strain or pull comes upon the rope, and often it slips far enough to jam so that it cannot be untied. If made near the end of the ropes it may slip so that the parts separate. The knots most generally useful where rope or string are used are the square knot and the bowline. These knots, properly made, do not slip and

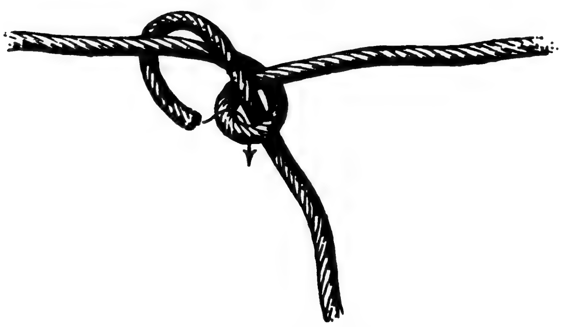


Fig. 3—Making a bowline. Arrow shows course of the end of the rope.

never jam. After a strain as great as the rope will safely bear they are easily untied.

The square knot is shown in Fig. 1. The course of each part is easily traced. Each piece of the rope as it passes through the knot comes out parallel to and along side of itself. The motions for making the knot are almost too simple to be described. When the right hand throws the end of the rope over the one held by the left and the first twist of the rope is completed, the left hand throws its end toward the right, and the right hand throws its end to the left, over the other, twisting them

Fig. 4—The bowline knot used to tie a rope into the middle of another rope.

together, and the knot is finished. The order of the motions and the method is of small importance if the turns of the rope are arranged as shown in Fig. 1.

The square knot answers for securing all kinds of string and rope up to a size where they become so stiff that the parts can not be pulled down so as to touch each other. In that case a piece of stick is sometimes put into the center of the knot. It must be large enough to

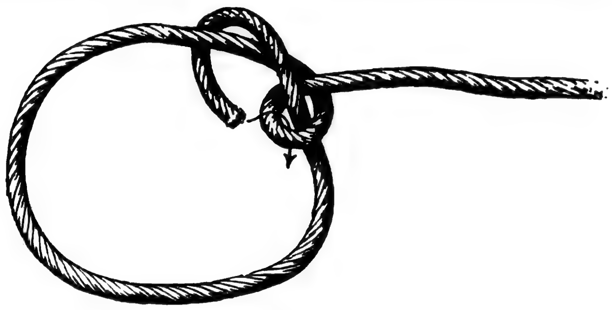


Fig. 5—The bowline knot used in making a loop.

fill the space so that the turns of the rope bear against it.

The next knot worth knowing how to tie is called by sailors, the bowline. Why it has that name nobody knows, though we may guess that it came from the place in the rigging of a ship where it was used. One form of it for fastening two large stiff ropes together is shown in Fig. 2. Here the strain on the ropes pulls the parts together and prevents them from slipping. This knot differs from the square knot in that it cannot be tied while a strain is put on the parts. In this respect the

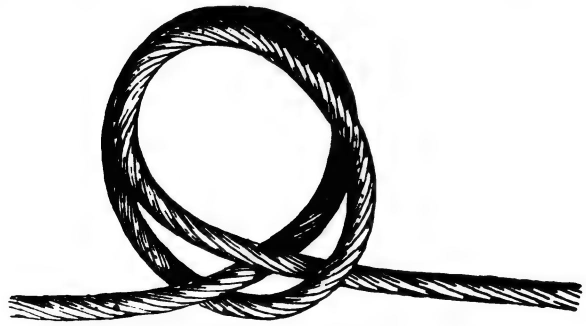


Fig. 6—The loops of the clove hitch.

square knot is without a rival, as it is the only knot that can be tied while drawing the ropes or string closely to each other on or around a package.

The method of making a bowline of the common form for smaller ropes is shown in Fig. 3. It is found by making a loop in the first rope, passing the end of the

second up through this loop, then carrying its end down about the under part of the main rope and down through the loop along side of itself.

The bowline is one of the most useful as well as the most secure of knots. By its use one rope may be tied into the middle of another as shown in Fig. 4, and in this

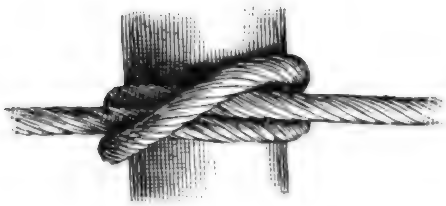


FIG. 7—Clove hitch made around a log. Perfectly secure against strain in any direction.

position will not slip along the rope under any amount of strain. By turning the end of a rope back upon itself and then making a bowline as shown in Fig. 5, a perfectly secure loop can be formed. It is the only quickly made knot by which this result is possible. In making a loop of this kind, the knot is begun at a suitable distance from the end so that the loop shown at the left will be the required size after the knot is made.

These knots are sufficient for every purpose that the

FIG. 8—Showing a strand (braided rope) tucked into a piece of Manila rope.

ordinary man ever meets. The bowline will enable him to make fast a small rope to a large one or a small line to a rope and can be used in any place where the square knot is not applicable.

There remains to be described a method of making a rope fast to a solid object, which is quite as important as the knots just described. This is the "clove hitch." It is one of many used by sailors. The name undoubtedly comes from the separation between the two parts.

The "clove hitch" is made up of two simple loops thrown over a stake or similar object. The loops are simple half

FIG. 9—End of rope unlaid to begin a splice.

hitches or single turns of the rope about the object. That part of the rope connecting the two loops rides over each turn, see Fig. 4, and produces great friction. This hitch can be put on when there is a strain on the rope and it will hold without slipping until the rope breaks. When the turns are brought together and drawn tight they appear as in Fig. 7. The security of this hitch depends entirely upon its great function. It will fasten a hammock between two smooth vertical iron posts with no danger of slipping down. No matter what the direction of the pull may be it holds firmly.

Next to knowing how to tie a knot it is important for a man to know how to splice two ropes together. The common short splice made without any of the sailors refinements is easily learned and is quickly made. Besides the rope to be spliced one needs a bit of string and a ten-inch piece of old broom handle sharpened to a point, or something equivalent to it. What is necessary is a sharp stick that can be put under a strand to lift it up so that another strand can be tucked under it.

The method of tucking one strand of a rope into another is much like basket work. The strand goes under one strand of the rope and over the next. How this is done is shown in Fig. 8. When a strand is tucked in this way three or four times, it will break before it can be drawn out.

The first step in making a splice is to untwist the rope. The beginner will need to untwist till the strands are about as long as ten times the diameter of the rope, as

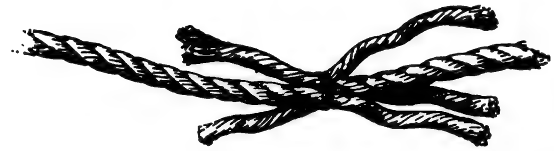


FIG. 10—Tow rope brought together to begin a splice, whipped at the meeting point.

shown in the left hand side of Fig. 9. The next step is to butt the two ropes together with the strands of each rope going between the strands of the other, then to tie them fast with a piece of string around the middle point. This is needful if a nice job is to be done. Fig. 10 shows just how this should be done.

Next take the rope in the left hand close up to the whipping, grasping the strands firmly. Turn the rope a little, as may be needed, to bring one of the loose strands on top. This strand is now resting against a strand which is held in the left hand. Next, with the point of

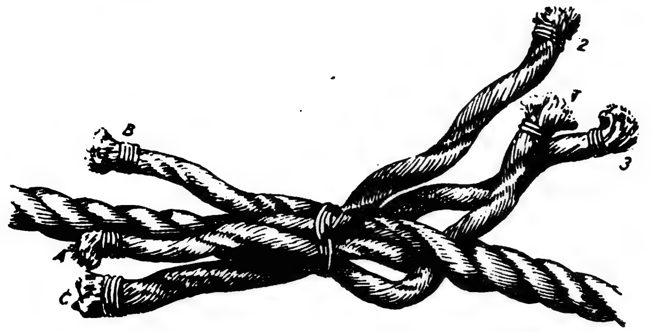


FIG. 11—First step in making a short splice. Strand No. 1 is tucked under strand B, but not drawn tight.

the sharpened stick, lift up the next strand and push it outward so that the loose strand can be tucked under and pulled through. How this is done is illustrated in Fig. 11, which shows the strand is just tucked through but not pulled tight.

It will be seen that strand No. 1 has been carried over strand A and under B. The rope is now turned toward the person, bringing strand No. 2 on top. This is now carried over B and under C and tucked as before, and the operation repeated with strand No. 3. The splice is now turned end for end and the strands which have just been tucked are held in the left hand. The strands bearing letters in the illustrations are next tucked in order as before. See Fig. 12. When they have been tucked the splice may again be turned and the tucking proceed as before. It is sufficient to tuck the strands three times each. The rope is then probably as strong at the splice as at any other point.

To make a nicely tapered splice the expert—after the strands have all been tucked once full size—separates each strand and cuts about one-third of the threads of which it is composed. After the next tucking all round half of the remaining portion is cut away and at the third tuck only a third of the strand is left. What is left over should not be cut off too close. The spare ends of the

strands should be as long as the diameter of the rope. After the strands have been tightly drawn together, ends

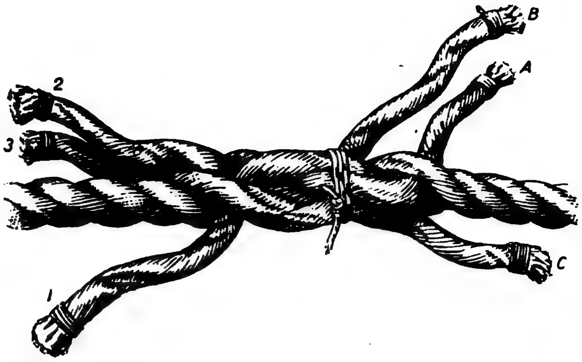


FIG. 12—Splice trimmed end for end; first strand tucked on opposite end, A going over No. 1 and under No. 2.

cut off, etc., the splice should be rolled under the foot to compress it and smooth the strands.

THE LOW TENSION MAGNETO.

Occasional Ailments Which Often Affect Spark Timing.

The main difference between high and low-tension magnetos is that the latter has only a primary winding to the armature, whereas, the high-tension has a secondary winding also. Nor has it any distributor. The low-tension contact breaker is placed in the combustion chamber of the engine, and is operated mechanically by cams and tappets, driven by special gear from the valve camshaft.

With so few parts in the magneto to get out of order it is seldom that trouble is experienced at this point. So long as the wires are making a good connection, and allowing the current to pass to the insulated plugs, which form part of the contact breakers in the cylinders or igniters, and the bearings are judiciously oiled, one can rely on it doing its duty satisfactorily.

The first part which demands attention is the igniter, or contact breaker. This consists of a special type of insulated plug let into the combustion chamber, but having only one terminal instead of the two wires to be found in the ordinary high-tension sparking plug. This single electrode has held in contact with it by a spring the contact breaker proper, and it is made very strongly, being sometimes three-eighths of an inch in diameter. It is essential that this should be stout because it has to withstand a constant hammering action, caused by the rocking arm of the contact breaker returning to position after it has been broken away from contact with the centre of the plug. This rocking arm is usually carried in a separate plate, bolted to the cylinder in such a position that the arm normally rests against the plug.

To obtain the movement on the rocking arm necessary to effect the break of contact inside the cylinder and so cause the spark, vertical tappets are so arranged that the top of each forms a rest for the rocking arms, and as the cams operating these tappets force them upwards, the rocking arms must also move.

Wear on the points of contact between the tops of the tappets, and the under part of the rocking arms will, it must be evident, affect the "timing," by causing the break of contact inside the cylinder to be made late—which is equivalent to retarding the spark lever on a car. A certain amount of wear also takes place on the two points of contact inside the cylinder, which, in conjunction with wear on the other two points of contact referred to, may seriously affect the running of the engine.

The effect of wear in this way is generally denoted by harsh running and knocking. If the engine has suddenly given out and no sparking occurs, it is probable that the insulation of one of the plugs has broken down, thus spoiling the lot. The remedy is to cut out the faulty cylinder temporarily and run on the others. Sometimes knocking is caused by the igniter becoming incandescent and causing pre-ignition.

Wear on the inside points of contact can be partially remedied by screwing up the insulated plug so that a new and unworn part of the metal in the centre is brought opposite the rocking arm. Wear on the rocking arm is more serious and necessitates a new one. Some operating tappets are provided with facilities for adjustment, and where this is so, the wear in both the tappets and rocking arms and plugs can, to a certain extent, be adjusted. The contact points inside the cylinder should be kept clean.

Misfiring can often be traced to a carbonaceous deposit on one or both points. An old tooth brush and a few drops of gasoline will work wonders in such cases, but if the deposit cannot be removed with these expedients, it can be removed with a piece of emery cloth. After cleaning with brush and gasoline, brighten up the contact points with something suitable.

In some of the older forms of low-tension contact breaker, trouble was experienced through the compression leaking by the rocking arm, where it passed through the plate, with the result that entirely new plates and rocking arms were often required before any appreciable wear had taken place on the contact points.

Garages in Cold Weather.

A warm garage is essential for the car that is to be run in the winter. This is true because the rubber of the tires is always full of moisture absorbed from the out-door air, and if the night be cold they will be frozen absolutely stiff by morning. A Canadian expert states that he has seen tires frozen as hard as a piece of rock. Naturally there is a depression where the tire was in contact with the floor, and this remains until the rubber is thawed out. To run the car with the tires in this condition means ruin for the latter.

Another thing to be remembered by motorists is that hence a greater proportion of this fluid must enter the gasoline does not vaporize so well in cold weather, and carburetter, particularly when the car is first started. This is best accomplished by decreasing the amount of air entering the carburetter thereby making the proportion of gasoline greater. A rag or old glove may be inserted into the air intake, so as to shut off the latter to some extent. Then when the engine is running normally this obstruction may be removed. A better device still is a cork which just fits the intake, and which is perforated by a small hole.

Starting in Cold Weather.

One way to start in cold weather is to warm the cylinders by squirting gasoline into them and firing it with a match at the compression cocks. A few drops of gasoline in each cylinder is all that is necessary, and the match is held to each open compression cock in turn. The resulting small explosion imparts just enough heat to the walls so that after the crank has been turned twice to expel the burned gases, fresh injections of gasoline will evaporate and ignite at once on turning the crank.

Obviously, before resorting to this device, one should make sure that there is no stray gasoline vapor about,

such as might be due to excessive and fruitless priming of the carburetter, as this would be quite apt to lead to unlooked for and somewhat disastrous consequences, and the driver who does not regard the presence of oil and gasoline splashed over the motor promiscuously had better taboo this expedient. Lubricating oil absorbs gasoline to a certain extent and is then more inflammable.

Automatic Carburetters.

Many carburetters depend upon automatic air valves for their satisfactory working. That is to say, a certain fixed amount of air is always admitted beneath or across the jet, and then there is some arrangement of spring controlled air valve which is sucked open as the speed of the engine increases. Of course, there are plenty of carburetters in which the additional air is provided positively by some inter-connection with the throttle, but we are not discussing this type. Properly adjusted, the automatic carburetter of the spring controlled type is satisfactory, provided always that the spring controlled valve is really well made and so designed that when it is shut it is not leaking. There are many variations of this type of automatic air regulator, and all the best have some form of atmospheric buffer or its equivalent to prevent too sudden an action of the valve. The majority of users of automatic carburetters, however, do not realize how very much depends upon their free and smooth working.

What is not realized is that the proper opening of this extra air inlet as the speed of the engine increases is essential to a quick pick up. When the valve is closed the engine speed is low, but if on the opening of the throttle the extra suction of the engine does not instantly begin to open the extra air supply the engine will only respond sluggishly, for the simple reason that it is being more or less choked with too rich a mixture. As soon as the speed gets up, the sluggishness of the air admission will automatically check itseslf, as the suction of the engine will become so strong that the air valve is, as it were, dragged open. At the other end of the scale, if it closes sluggishly, there will be pops back into the carburetter. Frequently the automatic air valve should be taken out and carefully examined. It should be cleaned, and it should be seen that the valve is perfectly free. Most of the air valves slide on some form of central stem with a spring to keep them in position, and all the moving parts should be most carefully cleaned. It will very often be found on pushing the air piston up and down it is not quite free. It can hardly be said to hang, but there is just a suspicion of a hitch in its action.

It is not enough to see that there is no dust on the valve and its connections, and the best way we know to put everything in perfect order is to polish all the working surfaces. This alone will often make a difference between a sluggish engine and one which dances away in instant response to the throttle. Still better results will be obtained by blackleading the edges of the valve and the guide or stem on which it works, and it is equally important that the buffer piston, if an air dashpot be fitted, be carefully cleaned and polished, too. It should be clearly understood that no emery should be used; otherwise air leaks will be set up. All that is wanted is perfectly smooth surfaces, so that the valve can respond instantly to the varying degrees of suction to which it is subjected.

If after this attention the car is not lively or if the engine pops back in the carburetter it is evident that the spring of the automatic valve requires adjustment. Speaking generally, sluggishness of pick-up shows that the spring is too strong, so that the air valve does not open soon enough. If popping back in the carburetter takes place when the car is running at a moderate speed and without any sudden closing of the throttle to provoke it, it may be taken as a certain indication that the spring is too weak, so that the air valve opens prematurely and weakens the mixture too much at low or very moderate engine speeds.

Care of the Horn.

In case dust gets on the tongue of the reed of the horn it may be removed by passing a slip of thin paper under the reed—a cure that seems too simple to record, but many a motorist under these circumstances jumps to the conclusion that the tongue has lost its set, and begins to bend it about or pass a knife blade under it, with the result that a new reed is required. Another trouble is a leaky or punctured bulb, generally curable by patching; and the third is a broken flexible connection. Breaks in the flexible tube are due to want of support, and it is not the slightest use to mend the break without adding proper support. When sufficiently supported, the flexible may be rendered air-tight temporarily by wrapping it in thin rubber sheeting taken from the repair outfit, and binding tightly with thread for an inch on each side of the break, after which a piece of canvas should be wrapped over the rubber and tightly bound down. The first opportunity should then be taken to shorten the flexible tube, and to solder the union piece on to the cut end.

Knowledge and Experiment.

The times when a car is broken down are still unpleasantly great. It is perhaps no exaggeration to say that 90 per cent. of these break-downs are embarrassing solely because the repair men or the drivers are but superficially acquainted with the details of the mechanism, and consequently are unable to remedy matters at once.

The thoroughly competent repair man, the man who has helped to construct automobiles and is thus guided by a full knowledge, can in the majority of cases put his finger unerringly on the defective part and will have the machine running again in less time than it will take the "rule of thumb" man to try one thing after another until he stumbles upon the cause of the difficulty.

Slack Steering Gears.

In many steering gears slackness due to wear is found to a much greater extent in the end play of the worm and segment than in the worm teeth themselves. The only way to make a durable job in taking up end play is to use hard steel washers or discs as large as possible, and provide passages for oil or grease to work across their surfaces. If it were not for the difficulty of cutting it to shape, the blade of an old saw would make excellent thrust washers for this purpose.

One-thousandth of an inch wear of a connecting rod after 15,000,000 revolutions shows how perfectly cars can now be made.

When cranking the engine, place the thumb against the index finger and take the crank handle between the four fingers and palm of the hand. Should a back kick occur the hand will open readily and no injuries will result.

A chocked muffler will cause an engine to miss sometimes because of the back pressure.

TROUBLE DEPARTMENT.

Questions answered by the Y. M. C. A. Automobile School, 322 West 57th St., New York.

This department is intended to be a "trouble clearing house," and it will be esteemed a favor if our readers will add information to it from their own experience or knowledge.

Starting in the Cold.

From A. A. Gray, South Dakota.—I wish to ask how to overcome the difficulty of hard starting of the engine in cold weather. Sometimes when my car stands out in the cold in frosty weather it is very hard to start. Is there no way of warming up the carburetter so the gas will generate as it should?

Reply.—As gasoline does not vaporize so well in cold weather as in warm, a greater proportion must enter the carburetter, particularly when the car is first started. This is best accomplished by decreasing the amount of air entering the carburetter, thereby making the proportion of gasoline greater. A rag or old glove may be inserted into the air intake so as to shut off the air to some extent. Then when the engine is running normally this obstruction may be removed. Or a still better device is a cork which will just fit the intake, and which is perforated with a small hole.

Rough on Steam Cars.

From G. C. Glover, New Richmond, Wisconsin.—I noticed in the November number that Edmund Willey was about to purchase a car, but was undecided as to whether to get a steam or a gasoline car. I also noticed an article written by A. M. Kransz, of Chicago, giving an itemized expense acoount of operating his steam car which he had run 5,350 miles. I wish to say that my father, my brother and myelf have owned and operated five steam cars, two 1905 Models, one 1906 and two 1907 Models, and we could not operate them as cheaply as Mr. Kransz did his car nor have we heard of any one operating a steam car in this part of the country who could. The repairs on our cars cost us from $800 to $1200 per car and we know of a lady in Minneapolis who operated a steam car for one year and it cost her $1400 for repairs The very best we could do on a gallon of gasoline was from six and a half to seven miles. I could write a book telling why a man should have a gasoline car in preference to a steamer. Steam cars are weak in a great many parts and are continually breaking down. I think we broke seven or eight crank shafts and eight or ten beveled gears in a rear axle. I couldn't take any comfort in driving my car, as I expected it to break down every minute. Our cars were on fire several times, but, luckily, the fires were extinguished before any great damage was done. The pilot light is a great annoyance on account of constantly going out and the vaporizer becoming plugged. I would advise you to not purchase a steam car; do not take one if it is given to you. We have sold all of our steam cars and have now two four-cylinder Oldsmobiles and one six-cylinder Oldsmobile. I ran my car to Chicago this year and since May 24 have run 6,553 miles and have not spent a five cent piece for repairs. I had two casings repaired, one costing $2.75 and the other $5.60, and have purchased one new inner tube. That is the extent of my tire bill. My other expenditures were simply for oil and gasoline. A quart of cylinder oil in a gasoline car will go just twice as far as a quart of oil in a steam car. I get over 200 miles on a quart of lubricating oil and from 1.200 to 1,500 miles per gallon of gasoline with my gasoline car. A gasoline car is always ready to run. There is always a delay in starting a steam car, as you have to start your engine and pump water into the generator to get up steam. In climbing a hill of any length, a steam car always gets short of steam; in other words, your steam car gets tired before it gets to the top and you are lucky if you don't have to stop when you get about half way up to get up steam. An up-to-date gasoline car makes a hill, no matter how steep nor how long, very easily, compared with a steam car. You can also run a gasoline car all winter by putting a solution in the radiator and it doesn't make any difference whether the car is kept in a warm place or not, as it won't freeze. A steam car must be kept in a warm garage.

(Note by the Editor.—In justice to the steam car it must be stated that our correspondent probably had a rather exceptional experience. Many who use steam cars are their staunch advocates, although the best evidence that gasoline cars are to be preferred for most purposes and places, is the fact that more than four-fifths of all cars that are sold are gasoline cars. As to hill climbing, we have seen a steam car beat every gasoline car pitted against it, although this fact is not conclusive; it is merely a bit of evidence. Moreover, the world's record of 48 3-5 seconds for a mile, on a circular track, was made by a steam car, and in some of the great races a steam car is barred, simply because it is pretty well known that if allowed to enter it would win, hands down. Neither does this last fact amount to much in measuring up the comparative merits of gasoline and steam cars for general practical purposes. It is, however, desirable to judge impartially and from various view points.)

Cost of Running a Cadillac.

From W. H. Trafton, Carmel, Maine.—I see you publish the cost of running steam cars, and possibly the cost of running my single cylinder Cadillac may be of interest. I bought my car new in June, 1907, and have run it 6,225 miles on 425 gallons of gasoline at 15 cents per gallon, the cost of running standing thus:

Cost of gasoline	$63.75
Oil and grease	10.35
One new casing	31.00
Repairs	10.60
Batteries	7.50
Total	$123.70

This is a little less than 2 cents a mile, for the car carried on an average three passengers. Three of my tires have never been pumped since I owned the car and they look good for another summer's run. They are Hartford-Dunlap tires. My car seems as good as it did the day I bought it. I do all the driving and make all the minor repairs. I think I have done well with my car and would like to hear from other car owners.

Water in the Radiator.

From I. W. Turner, New York.—I have often noticed when one asks what to do with a car which is to be laid up for the winter, that the advice is to be sure that all water is out of the radiator, etc. Right here is the rub. One opens everything from which water can run and thinks the job complete. I thought so too, and later on learned that just enough was left to cost me nearly $50 for repairs in the spring. All risk can be eliminated absolutely if, after you think all the water is out, you mix a pint of wood alcohol and the same quantity of water together and put it in the radiator, allowing it to remain during the winter.

When a Car Goes Wrong.

In looking over a strange machine that will not run, the repair man may first inspect the conditions of the gasoline tank. Do this before even trying to crank the engine, for if the tank is empty it is useless to crank the engine, and it is surprising how often an empty tank is the cause of the stoppage.

Next see that gasoline flows into the carbureter. Then look at the switch to see if the current is on; then crank a few times, and, if you fail to get an explosion after two or three turns, notice particularly whether the vibrator buzzes or not. If it doesn't, look at the coil and connections, and if these are satisfactory test the batteries with a pocket voltammeter, and if any are defective they are replaced. If the vibrator "buzzes" all right but you get no explosion, take out the spark plug; and if sooty, brush it off with an old tooth brush and then lay it down on the engine with the wire still fast to it and turn the engine over to see how it sparks.

The points should usually be about 1-32 of an inch apart.

Some of the symptoms of trouble while running are explosions in muffler. These indicate weak batteries, poorly adjusted coil, poorly adjusted carburetor, or leaky valve and should be tested out and remedied as such.

Misfiring may be caused by weak batteries, poor gasoline mixture or loose connections. If engine runs all right at low speed but misses on high speed it means either weak batteries or the vibrator is too stiff.

If the spark lever is too far forward, causing too early an explosion, there will be a sharp, jarring knock. Letting the other mechanism remain the same, pull back the spark lever; and if this does not stop it, the knock may be caused by a loose crank bearing, loose piston bearings, loose fly wheel or loose main bearing, and each should be examined in turn. Lack of cylinder oil will also cause a heavy pound.

If batteries, coil, plug and carbureter are working right, but engine fails to develop its usual power, the cause is usually lack of compression due to leaky valves, leaky cylinder head or worn piston rings.

To regrind a valve use a little emery powder and turn the valve with a screw driver either by hand or in a brace if possible; care must be taken, however, not to let emery get into the cylinder.

A thick, heavy smoke issuing from the muffler indicates too rich a mixture and a thin, light smoke indicates too much cylinder oil generally, though some cylinder oils give a rather dense, black smoke. However, the odor quickly tells one which it is.

The main thing for the repair man to remember when first going over an automobile engine is that no matter how complicated it looks it is primarily a gasoline engine and the knowledge he has gained in running his shop engine must be applied here.

Test your cylinders, one at a time, and see if one is not taking its impulses in a sluggish, ineffective way, while the others are doing most of the work. If you find this to be so, as you often will, look to your spark at the right instant and adjust the weak cylinder, so that its vapor charge is exploded at the very second when its driving force will be of greatest use.

Never run with unduly slack chains. If your car has countershaft brakes, remember that they would be useless if a chain were to come off.

To Get the Most Out of Tires.

Under no circumstances overload or overspeed. Either is reckless waste. One large operating company dismisses employes who overload as much as fifty pounds. Rubber has a certain amount of "life," and if persistently overworked it cannot recuperate.

Keep brakes working equally and all wheels "trued" up. This not only economizes in wear on the truck but prevents unnecessary strain on any one of the tires.

Do not allow oil or grease to accumulate on tires, as they cause decay.

Flushing the Lubricator.

A lubricator in which pressure is maintained by connection with the exhaust pipe gradually accumulates particles of soot, which find their way past the filter usually interposed in the pressure connection, and in time probably clog the filter itself. In addition to emptying the lubricator and washing with kerosene, it is frequently well to flush the sight feeds and oil-distributing pipes also; and this is easily done where pressure can be put on the same without running the engine—which, if continued for more than a few moments, would be rather dangerous to the bearings and pistons.

To Remove the Gear Wheels.

When attempting to remove sprockets or other gear wheels from shafts to which they are attached by means of taper or plain fits and keys, care should be taken not to use the hammer too freely, for fear of either fracturing the gear or springing it out of line. A so-called "pulley-puller," or special jack may be contrived without difficulty under almost any circumstances, and by its use the part may be removed without imposing any undue strains upon it.

Care of the Lamp.

While it is common knowledge that acetylene lamps must be kept scrupulously clean, motorists often imagine that an oil lamp ought to run a whole year without an internal clean. One of the commonest reasons for oil lamps going out is the choking of the draught holes in the cap of the lamp by heavy deposits of carbon. These should be looked for and removed before any lengthy drive by night. The other essentials are a good lamp, good oil and a clean, dry wick.

Beware of the Cold.

If the garage is not heated, the water should be drained from the radiator every night when the weather is cold enough to freeze it. The entire cooling system should be drained of every drop, as in freezing the water expands and will crack the water jacket. If a good non-freezing solution is used, one that you know can be depended on, of course the above is not necessary.

Worn bolt-holes should not be neglected, for as the diameter of the hole gets larger the amount of wear increases. A hole which has worn a thirty-second of an inch in one season, if not bushed, or enlarged and fitted with larger bolts, may be worn away as much as an eighth of an inch in a second season.

Almost incredible speed is now being attained in the engine with phenomenally long strokes, so that former calculations as to power have had to have new formulae prepared to include the stroke.

Get Special Tools.

One often hears a car driver ejaculate, "Well, I shouldn't care to be the chap who assembled this car! How on earth he gets some of these nuts on puzzles me!" Now criticism in the fitting shop is more fearless and more garnished with expletives than the criticism which accompanies amateur tinkering by the roadside; again, this criticism comes to the foreman's ears in the natural course of events; and, once again, the directors and officials of the manufacturing firm drive a sister car themselves, and have occasion now and again to perform by the roadside the very same operations which are necessary for the private owner. These individuals are even more concerned in the future of the car than any single purchaser; and it may be taken for granted that if the particular operation the buyer finds so intensely awkward were actually and necessarily awkward by reason of its inherent nature, the makers would ere this have altered the design and disposition of their parts. Their fitters probably assemble and disassemble this especially objectionable nut or union with ease and celerity; and the contrast between the one operation as performed in the factory fitting shop and on the road ten miles from anywhere resolves itself simply and solely into the possession of the suitable tools; or, to put it more concretely, the fitter uses a special open-ended spanner with a kink in its handle, and you use a common adjustable screw wrench. A very few weeks are usually sufficient to inform an owner which parts can be dismantled with the ordinary stock tools and which cannot. Having made these discoveries, he should without loss of time acquire the necessary special tools. They ought to have been supplied with the car, and most probably a firm letter of remonstrance will procure the desired tool by return without charge. But, if not, he can choose between designing it himself and getting it made by the local blacksmith at a moderate cost, or swallowing his chagrin with the best grace possible, and requesting the manufacturer to invoice it to him. As an example of what I mean, I have spent eighty minutes in getting the carbureter off the car I am now driving, with the tools out of my tool case; and I have got it off and back again within twenty minutes with the aid of two special spanners, similar to those used in the manufacturer's fitting shop.

Remedy for Faulty Wiring.

Some of the old pattern cars, possessing excellent engines and gear boxes, give a wholly disproportionate amount of trouble with their ignitions, largely due to primitive wiring arrangements. If the wires be followed out through their peregrinations round the chassis it will be found that a cheap, light pattern of stranded low tension wire is curled round the moving parts and the interior of the coach-work, and is secured by metal staples hammered into the woodwork, or by thin metal clips hitched to a waterpipe or other metal part. There is generally room for play at these points, especially on the contact breaker wires, and there is no extra insulation. All the low tension wires should be collected and wrapped together with worsted—not plaited together as they probably were previously. A piece of stout twin should be attached to one end of the wires, and they can then be hauled bodily through a piece of rubber hose about ¾ in. internal diameter. This hose can be secured to the coachwork where necessary by a metal clip, padded with a slip of rubber cut from an old tube or tobacco pouch.

Advancing the spark only gives increased power of itself by permitting the motor to take better advantage of each change of fuel.

A Too Rich Mixture.

Overheating of the engine, when it is not traced to poor circulation, is almost always caused by too much gasoline. There are, however, many possible causes of over-rich mixture, some of which on the face of them might seem rather to be caused of lean mixture rather than rich. Prominent among these latter is too low a gasoline level in the float chamber, due to the float valve closing too soon. The immediate effect of this is to make the mixture too lean at starting and at low speeds. Starting is therefore difficult, and if the auxiliary air valve begins to open at the usual motor speed the mixture will again be much too lean. These symptoms, however, unless properly interpreted, will probably lead the owner to increase the gasoline supply, or to adjust the spring tension of the auxiliary valve so that the latter will not open until quite high speed is attained. It is well not to be too easily satisfied with the carbureter's performance, as it may be found that one fault has been imperfectly offset by another fault in the other direction, instead of the correct adjustment being made where the fault really lies. A good carbureter will give a sensibly correct mixture at all speeds within the ordinary range of the engine. If it fails to do this the thing to do is to investigate until the trouble is found.

In the Interest of Economy.

People seldom take the trouble to thoroughly empty out and wash the interior of gear-boxes and crank cases, and yet heaps of metal is worn off the teeth of wheels sometimes. The particles that wear off the teeth of gears are glass-hard, as a rule, and form an abrasive powder that, mingling with the oil or grease, attacks the bearings and axles, besides assisting to further demolish the teeth from which it has been detached. A systematic and frequent emptying and sluicing out of gear-boxes, differentials and crank-pits is a practice much to be commended, and it should be done before fresh lubricant is added, so as not to waste more than is necessary. It is possible, where rigid economy is studied, to utilize the oil or grease again by warming it sufficiently but gently until all the dirt settles at the bottom. In the case of oil the clean portion can then be decanted, and, as an extra precaution, filtered, but it should be borne in mind that oil, however carefully cleansed, cannot be used to advantage indefinitely, for it loses its lubricating properties in a very noticeable degree; in fact, one can feel the difference between fresh oil and that which has been used some little time by merely rubbing it between the fingers.

Cold Weather Mixtures.

When the temperature drops as low as 40 degrees Fahrenheit all water should be drained from the radiator, cylinders and pump, and the radiator should be refilled and use either one of the following anti-freezing mixtures, preferably the last named: A mixture of glycerine and water in the proportion, by weight, of 25 per cent. of the former and 70 per cent. of the latter, to which is added 2 per cent. of sodium carbonate. Chemically pure calcium chloride dissolved in hot water in the proportion of four pounds to one gallon of water. Sodium chloride (common salt) or magnesium chloride dissolved in water in the proportion of one and one-half to two pounds to the gallon. Wood alcohol in the proportion of 20 per cent. alcohol to 80 of water. This solution has the advantage of being sufficient for average winter weather, and it has no ill effect of any kind on metals nor does it leave any sediment. Should the thermometer reach as low as 15 degrees Fahrenheit a solution of about 25 per cent. alcohol and 75 per cent. water should be used. For temperatures below zero use 30 per cent. alcohol and 70 per cent. water.

THE WATER FREEZING PROBLEM.

BY COKER F. CLARKSON (A. L. A. M.).

The cold weather is on, and the freezing proposition has come to the front again. There is certainly no reason why a water-cooled machine should not be run in any weather. It may fairly be said that the freezing problem is settled. For some years practical tests have been made, determining what mixture can be used in the cooling system of an automobile, to prevent freezing and at the same time not injure any part. Various salts, glycerine and alcohol have been considered.

Wood alcohol was chosen for the first experiment because there was not the slightest chance of it injuring any machine. The results showed that it is possible to use alcohol and water mixed to resist almost any degree of cold.

Then the question of whether alcohol would separate from the water and waste away so fast as to make the expense prohibitive was taken up. It was felt that considerable alcohol might be lost on mild days. A water-cooled automobile was taken and seven gallons of water-alcohol mixture, eighteen per cent. alcohol, put in the cooling system. By connecting to the top of the radiator a bottle, into which a pipe led from above the water level, it was found that except under extreme conditions, such as on a mild day, allowing the engine to run without a fan while the machine was standing still, no vapor at all arose.

This led to the thought that it might be possible to close the cooling system entirely in cold weather, obviating any chance of loss by boiling away. A pressure gauge connected to cooling system so closed indicated a pressure of only six pounds under very severe conditions. This means that there are some machines that can be run without loss practically of alcohol and water from the cooling mixture.

It is also possible that many machines that have relief tubes can be run with a closed system. The safest way to find this out in an inexpensive manner is to take a small bit of rubber tubing, fitting the end of the blow-off pipe, put a wooden plug in one end of the tube, and slip the other end over the pipe lightly. Any pressure that could injure the machine at all would blow the tubing off and prevent injury.

When the temperature was as low as fifteen degrees below zero a mixture of water and alcohol (thirty-three per cent. of alcohol) resisted freezing perfectly, even when the car was left outdoors all night. With the temperature around fifty or sixty degrees Fahrenheit, this mixture (thirty-three per cent. alcohol) will boil slightly.

It is not probable that the temperature will drop below ten degrees above zero before the first of December, in which case fifteen per cent. of alcohol in the mixture is enough. As the season progresses and zero temperatures are likely, nothing less than twenty-five per cent. of alcohol is safe.

The combined use of glycerine and alcohol mixed with water solves the question for both hot days and cold days;, the boiling point of glycerine being higher than that of water, will balance the low boiling point of alcohol, so that the boiling point of the mixture will be reasonably high.

As the percentage of glycerine required to meet a given temperature is much larger than the required percentage of alcohol, and as a matter probably of comparative cost, a mixture of alcohol and glycerine for use in the water is better, although glycerine slowly but surely destroys rubber tubing connections.

A mixture of water and glycerine (thirty per cent. glycerine) will freeze at about fifteen degrees Fahrenheit. To be safe at ten degrees below zero, about fifty-five per cent. glycerine in the water is necessary.

Twenty-five per cent. of half alcohol and half glycerine, added to water, will resist freezing at eight degrees Fahrenheit. Thirty per cent. of half alcohol and half glycerine, added to water, will resist freezing at practically ten degrees below zero.

When the half-and-half mixture is used, the best results will be obtained by adding a small quantity of wood or denatured alcohol from time to time, as the weather gets colder, to reduce the freezing temperature. The glycerine will remain in the mixture without loss and insure against moderate freezing temperatures.

The right way to handle the cooling mixture is to find out the equation for your own car, using all the alcohol you can stand without boiling the mixture on mild days sure to be met in winter in this climate. Some machines will stand all alcohol, that is, mixed with water; others will not, and glycerine must be used to keep up the boiling point.

Tire Pressure.

"The air pressure in the tire must be proportioned to the weight it has to support, and for this reason drivers are advised to weigh their cars carefully and inflate their tires according to the table appended herewith, showing the maximum weight most good tires can bear," says B. F. Goodrich Co., of Akron, O.

Size.	Weight per wheel.
28 to 36 x 2½	225 lbs
28 to 36 x 3	350 "
28 x 3½	400 "
30 x 3½	450 "
32 x 3½	550 "
34 and 36 x 3½	600 "
30 x 4	550 "
32 x 4	650 "
34 x 4	700 "
36 x 4	750 "
32 x 4½	700 "
34 x 4½	900 "
36 x 4½	1000 "

Whether the tire is properly inflated or not is shown by the extent to which it flattens. When the car is loaded the tire should flatten about 2-5 of an inch, but should never under any circumstances be depressed more than 3-5 of an inch.

All Used Warner's.

The four winners of the Sweepstake races at the opening of the Long Island Motor Parkway, Oct. 10, all used Warner auto-meters, and have expressed their entire satisfaction over the fact that they were bright enough to equip their cars with the Warner instrument. Out of five events the Warner Instrument Company scored four firsts and two seconds. Herb Lytle, the driver of the winning Isotta car, which broke the world's best previous record, said: "No racing car should enter into a race of this character without being equipped with an auto-meter. It is a great gauge for the driver and tells him if he is going fast enough to win and acts as a constant guard upon his actions. The consistency of the time in each lap I made last Saturday was due to the auto-meter, and it severely acted as a check to my inclinations to loaf." Lytle and Louis Disbrow personally congratulated Manager Interredden, of the New York branch of the Warner Instrument Company, on the success of his auto-meter.

The Mayor of Hartford, Conn., has issued a warning to motorists to stop the use of muffled cutouts in the business sections.

The Trenton Rubber Manufacturing Company of Trenton, N. J., has opened an office and salesroom at 1997 Broadway, New York City. This step has been made necessary by the rapid increase in their business, particularly that portion of it relating to Inner Tubes and Thermoid Brake Lining. The meritorious character of these goods has made it necessary for this company to carry stocks in most of the large cities in order to facilitate rapid deliveries.

The Hoyt Electrical Instrument Works of Penacook, N. H., have opened an office at 161 Summer street, Boston, Mass., for the purpose of taking care of their New England trade. It will be remembered that this company manufactures the Hoyt Triune Voltammeter, which will be found illustrated and described in our advertising columns. The Boston office of the company will be in charge of H. F. Keller, a pioneer in the electrical field and well known in automobile circles. A complete stock of instruments will be carried at all times.

THE HOYT TRIUNE VOLTAMETER.

Users of the internal combustion motors have awakened to a realization of the fact that no matter how good a motor they may have it is worthless without a good ignition system, and they have also realized that no matter how good an ignition system they have it is difficult to keep it working properly unless some means are at hand by which

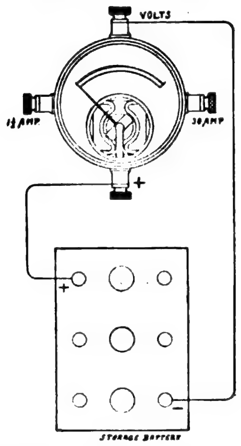


FIG. 1—Method of testing storage battery with Triune.

to keep it in proper adjustment. Instruments in which the movable member is constructed of iron have been found unsuitable for testing induction coils, and until recently the only instrument offered the motorist was of this type. No one would think of running a steam plant even for domestic heating without suitable gauges, yet they are not nearly so important in the heating plant as in the ignition system, which is the heart and life of the explosive motor.

The D'Arsonval principle of measuring electric currents has been in commercial use in connection with electric light and power plants for more than twenty years, but instruments embodying this principle were so large and expensive that their use in connection with the ignition systems of explosive motors was not considered practical. However, within the past year, greater strides have been made in this direction, and the motorist can now buy instruments of this type that will compare very favorably in accuracy and stability with the larger instruments, and at only a fraction of the cost of the latter.

The Triune Voltammeter consists of a D'Arsonval type instrument, which has its windings so calculated that it

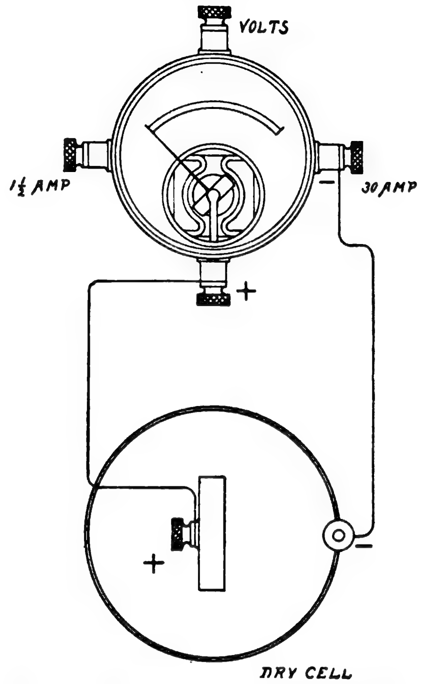


FIG. 2—Testing dry cell with Triune.

will give very satisfactory results either as a voltmeter or an ammeter. By connecting the bottom post to the positive and the top post to the negative of the current to be measured a very high resistance coil is introduced into the circuit so that the instrument indicates the voltage of that circuit, as shown in Fig. 1, in which the voltage of a storage battery is being measured. By connecting the bottom post to the positive and the right hand post to the negative, as shown in Fig. 2, the coil of the instrument is in shunt with a very low resistance, and currents up to 30 amperes capacity can be measured. Connecting the positive to the bottom post and the negative to the left hand post connects

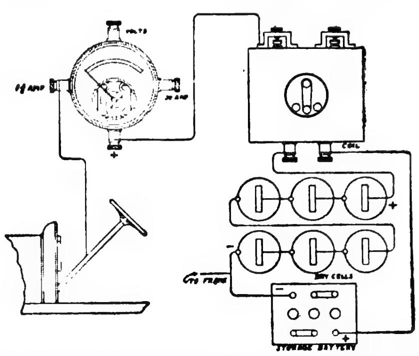


FIG. 3—Adjusting vibrator by means of Triune.

the instrument coil in shunt with a somewhat higher resistance, so that 1½ amperes maximum can be measured with this arrangement. Fig. 3 shows the positive of the instrument connected to the contact screw of a coil, while the negative is grounded on the steering column for the purpose of adjusting vibrators. In this diagram it is assumed that the positive side of the batteries are connected to the coil.

No doubt it would surprise those who have never attempted to adjust their coils to take a uniform amount of current to learn how much more efficient and smoother running an engine is when the coils are so adjusted, and still when one stops to think it is very reasonable, too, for a weak spark means increased fuel consumption, consequently more carbon in the cylinders. On the other hand, an abnormally fat spark means the extravagant use of batteries, vibrators, coils and spark plugs, and the troubles resulting therefrom. If further information be desired it may be obtained by addressing the manufacturers, the Hoyt Electrical Instrument works, Penacook, N. H.

ONE GOOD DEALER IN A TOWN WANTED.—The Marshall Oil Company, Marshalltown, Iowa, have an announcement in this issue, in which they say that they want one good dealer in each town to sell French Auto Non-Carbon Oil, and will give an exclusive agency. Their advertising department will assist in making sales. Write for further particulars to the company, as above. Mention THE AUTOMOBILE DEALER AND REPAIRER.

TIRE REPAIRS THAT STAND UP.—Every dealer, garage owner and auto repair man, as well as the individual car owner, should be interested in the important matter of tire repairs. The Goodyear Tire and Rubber Company, Akron, Ohio, announce that they furnish "repairs that stand up." The wearing quality of Goodyear Treads is pretty well known. The Goodyear people will tell any dealer or repair man how to make these treads, for which they make and furnish the stock, or they will tell any car owner why their treads are desirable for the user. Write for book of samples, price quotations and full information, not forgetting to mention THE AUTOMOBILE DEALER AND REPAIRER.

NEW IMPROVED SECTIONAL VULCANIZER.—This device is manufactured by the Auto Tire Vulcanizing Company, Lowell, Mass. See announcement on another page and write for further particulars, mentioning THE AUTOMOBILE DEALER AND REPAIRER.

A GOOD THREADING OUTFIT.—We can commend to any automobile repair man the duplex die stock set manufactured by the Hart Manufacturing Company, 1362 East Third street, Cleveland, Ohio. This company manufactures a variety of sets, with desirable ranges for A. L. A. M. and other standards of threads. Write for interesting illustrated catalog, sent free if you mention THE AUTOMOBILE DEALER AND REPAIRERR.

WOODWORTH TREADS.—This popular device is easily attached to the tire and adjusts itself quickly without straps or buckles and stays adjusted. This tread is said to be almost indispensable where roads are cut with ruts or unusually rocky or full of deep, frozen and rough depressions. Write for further particulars to the Leather Tire Goods Company, Newton Upper Falls, Mass. See announcement on another page.

Auto-Contact Battery Boxes.

Any device which will simplify the operation and maintenance of a car as well as eliminate causes of trouble will be doubly acceptable to the man who motors in the winter as it is no pleasure to tinker by the roadside when the mercury is below the freezing point and the fingers numb and stiff or to risk the usual troubles with wet batteries at low temperatures. Another of the great advantages of the Auto-Contact Battery Box recently put on the market by A. Hall Berry, 97 Warren street, New York, is that all connections are automatically made by the mere closing of the lid through means of heavy phosphor bronze contacts. There is not a wire nor a binding post in the box except the short outlet wires at the back of the box which are of the highest grade ignition cable.

With it a set of old cells may be taken out and a new set inserted in a few seconds without even taking one's

New Battery Box

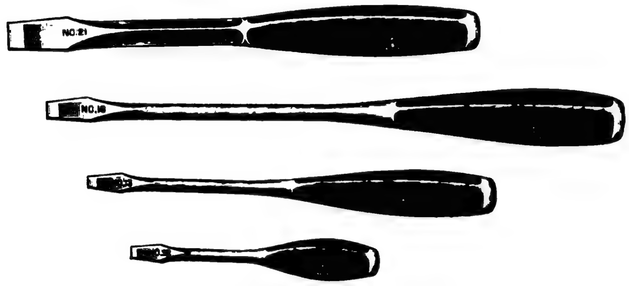
gloves off, while the same holds true if it is desired to test the cells in the usual way with the ammeter, as the binding posts are cleared and exposed to view the moment the cover is raised.

Another valuable feature is the simple system of two small switches, whereby the cells may be used in different electrical combinations to get the highest efficiency and the longest use. For instance, on the standard eight-cell box the cells may be used either in two sets of four cells each, controlled by the usual two-point switch on the coil box, or both cells may be used in parallel, a system preferred by many, as it gives less drain on each set of cells without increasing the voltage. For those who wish to run on eight cells, or who wish to get the last bit of efficiency from old cells, the switches may be set so as to bring all the cells into use in series, though it should be borne in mind that this increases the voltage. This setting of the switch also permits of the use of any lesser number of cells in series, such as six or even seven cells. Additional to the foregoing, provision is made to care for any cell that may go bad, bridges being provided like auxiliary switches to carry currents over, thus not interrupting current flow due to defective batteries. Another very valuable point is that the switches can be thrown to the "off" position and the box locked, and it is then impossible for any one to start the car without unlocking the box and moving the switches, as the current is entirely disconnected from the outlet wires. Moreover, for this Auto-Contact Battery Box no special cells are used, as any standard make of dry cells can be used with it.

These boxes are handsome enough in appearance for a six thousand dollar car and low enough in price for a six hundred dollar one. They are shipped complete with bolts for mounting to the running board and with short leads or outlet wires which, when once connected to the regular wiring of the car, makes it absolutely unnecessary to ever touch the wiring again. Motorists who have trouble with the old style battery connectors, wires, etc., will be quick to realize the possibilities of this box.

The B. & S. All Steel Screwdriver

We illustrate herewith a new and improved screwdriver, which has many points of excellence, and it is especially recommended for the use of automobilists and garage owners. This driver is a one-piece article, it is drop forged of steel throughout and the point is carefully tempered. The handle is of spec-



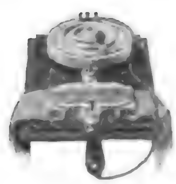
The B. & S. All Steel Screwdriver, Manufactured by the Billings & Spencer Company, Hartford, Conn.

ial design, insuring a positive and easy grip. There is nothing about it to loosen or get out of order. It is simple, light, effective and durable. These screwdrivers are made in eleven sizes, including two of heavier model with square shank for the application of a wrench.

This handy and exceedingly practical tool is manufactured by the Billings & Spencer Company, Hartford, Conn. Interested readers should write them for illustrated catalog and mention The Automobile Dealer and Repairer.

Electric Vulcanizers.

The C. A. Shaler Company, Waupun, Wis., are now manufacturing a complete line of Electric Vulcanizers. All Shaler Electric Vulcanizers operate by simply connecting them to an ordinary electric light socket. Their running expense is less than one cent per hour. They are



Type B.

unique in that they are a portable vulcanizer with an absolutely perfect heat control.

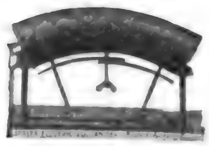
Type B (the original electric vulcanizer) is designed for auto owner or garage, and works equally as well on direct or alternating current. Type B will mend any puncture, tear or slit in an inner tube, and will even splice a tube perfectly. It will also mend cuts and punctures in outer casings without removing the tires from the wheels. Type B has a rheostat to control the heat. The price of this machine is $25 in aluminum and $20 in malleable iron.

Type BV is an attachment for Type B, and is interchangeable with the regular heater supplied with Type B. It is indispensable in vulcanizing valve

Type BV.

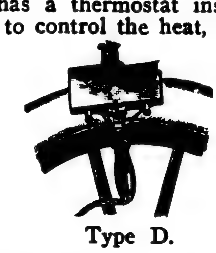
stems to inner tubes. The price of this attachment is $10 in aluminum and $8.50 in malleable iron.

Type C is for outer casings exclusively, and appeals especially to repair men, as it will mend a blow-out of any size in any tire at a very low cost. It applies the heat directly to the inside of the tire where the new canvas is placed. Price of Type C-71, for alternating current, iron model, $20. Type C-72, for direct current, iron model, $25.



Type C.

The C. A. Shaler Company also manufacture Type D, Shaler electric vulcanizer, identical with Type B, except that it has a thermostat instead of a rheostat to control the heat, and works



Type D.

on alternating current only. Price, in aluminum, $15; in malleable iron, $12.50.

The Geiszler Non-Sulphating Igniter.—On our inside front cover this month we illustrate the Non-Sulphating Storage Battery Igniter, manufactured by Geiszler Bros., 518 West 57th street, New York City. This Igniter is 6 volt, 60 ampere hour size, is sold at $15, and it is guaranteed for one year—an excellent value. Send for interesting free catalogue and mention the Automobile Dealer and Repairer.

For the Winter Months.

Those who lay up their cars during the winter months, or who have other reason to rest their storage batteries for some time, will be interested in the instructions given by Emil Crossman, of the National Sales Corporation, of New York, for the care of storage batteries. He says: "First, pour off the acid by standing battery upside down for fifteen minutes. Then fill up all the cells with clean water—preferably, rain water—and after about ten minutes allow this water to run out of all the cells. Let it drip thoroughly, and after this pour distilled water in all the cells until the plates are completely covered. Clean the connections, and oil them well; then screw in vent caps, and stand battery where it will not be subject to great heat or cold. To put the battery into commission, fill each cell with electrolyte, prepared as follows: Into a clean earthenware tank, or porcelain vessel, pour three and one-half parts (by bulk) of distilled rain water. To this add, while stirring constantly, one part of chemically pure sulphuric acid, 66 degrees Baume. When the solution has cooled, test it with hydrometer. It should read 1,260 degrees, specific gravity. The electrolyte should then be filled in carefully through the vent tubes of each cell, until it stands one-quarter inch over the top plates."

Adjusting Screws.

To prevent the setting fast of the adjusting screws of radius and brake rods, screwed valve caps, and other stationary parts exposed to moisture or heat, the threads, both internal and external, should be lubricated with mercurial ointment, which should not be touched with the fingers. Formerly when the junk ring bolts of marine pistons were screwed into the cast-iron head, instead of gunmetal plugs, this dressing was applied to insure their easy withdrawal.

Not That Kind of Folk.

An old farmer, who by hard work and thrifty habits had got together a small fortune, decided that the time had at length arrived when he was justified in ordering a family carriage.

He went to a carriage builder and described in detail the kind of vehicle he wished to buy.

"Now, I suppose you want rubber tires?" said the carriage builder.

"No, sir," replied the old farmer, in tones of resentment. "My folk ain't that kind. When they're riding they want to know it."—*Philippines Gossip.*

SPECIAL TYPE MODEL C. FOR FORD, S. N. R. & T.

This, a type made specially for this car, is easily attached and adjusted; no fitting required. Gives more power. Finest throttle control at all speeds. Saves gasoline and runs engine cooler. Is giving satisfaction in cases where four different makes had been tried before ours. Low in price, but high in quality. Satisfaction guaranteed or price refunded. Send for 1909 catalog.

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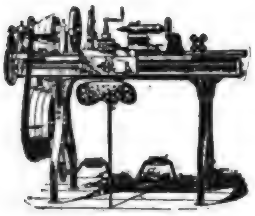
212 WEST SOUTH ST.,



THE BARNES LATHES

9" swing
11" swing
13" swing

For Repair Work our No. 13 Lathe is right; has 13" swing, auto cross feed, length of beds from 5 to 10 feet long; furnished with counter-shaft or foot-power.

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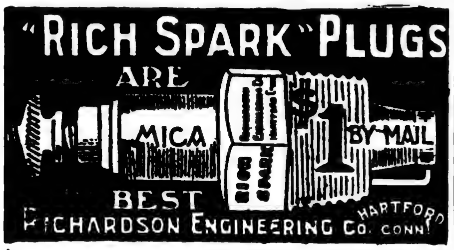

4x4 AIR COOLED MOTORS

$80.00 each for Jan. only
Transmissions,
$23.00 each.

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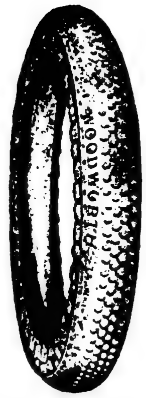
AUTO PARTS CO., 52 West Jackson St., Chicago, Ill.

Woodworth Treads

For 1909



WOODWORTH SELF-ADJUSTING TREAD. The newest and neatest. Easily attached to the tire, and adjusts itself quickly without straps or buckles, and stays adjusted. The Woodworth Self-Adjusting Tread gives the tire absolute protection. It is puncture-proof and prevents skidding. Presents an armored surface to the road and shields the tire perfectly. Is quite invisible when the wheel is in motion.

WOODWORTH ADJUSTABLE TREAD. This popular device will be continued as hitherto. This means that we shall make both the new Woodworth Self-Adjusting Tread and the popular Woodworth Adjustable Tread. In ordering be sure to designate the one you want. If you simply order Woodworth Tread the Adjustable Tread will be sent. If you want the Self-Adjusting Tread ask for it. New catalog about ready to send out. Write for it.

WOODWORTH "SPECIAL" TREAD for rutty roads. This tread is almost indispensable where roads are cut with ruts or unusually rocky or full of deep frozen and rough depressions. The sides of the tread are closely studded with round-headed steel rivets which protect the leather from scouring or grinding against the sides of the ruts, and the wear and tear to which they would otherwise be subjected on the kind of roads just mentioned. They have been in great demand in various parts of the country and have given absolute satisfaction everywhere.

WOODWORTH KANT-SKID protects the tire instead of injuring it. Takes firm hold on the road and makes skidding practically impossible. New sections can be put in when necessary without tools. Does not injure the road or the tire. Cheaper and better than any all metal device.

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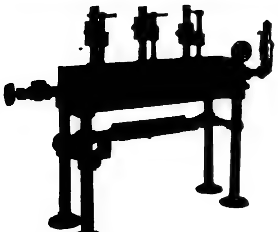

The "Boilerless" Steam Vulcanizer

NEWEST RELATIVE OF THE "EXCELSIOR."

Underneath the square semi-steel body is fitted our special gas burner, thus doing entirely away with boiler for inner tube work.

Furnished complete with steam gauge, safety valve, filling valve, air cock, and our well-known quick-acting clamps. LOW COST. HIGH SATISFACTION. Immediate Shipment.

WISHART - BURGE MACHINE WORKS,

64-66 SOUTH CANAL STREET, CHICAGO, ILL.

WANT ADVERTISEMENTS.

Under this head will be printed advertisements of shops for sale or to rent, or shops wanted, or situations or help wanted, or tools or machines (second-hand) wanted or to exchange, at the uniform price of two cents a word, which will include the address, for each insertion, payable in advance. No advertisement will be inserted for less than 30 cents, however small.

Remittances can be made in postage stamps if more convenient. Address,

MOTOR VEHICLE PUBLISHING CO.,

24 MURRAY STREET, NEW YORK.

FOR SALE—Two 20th century tire protectors, 32x4; guaranteed good as new. Price, $25. Cost new $56. N. L. Lee, Demopolis, Ala.

AUTOCAR 1906 touring car, 20 h. p. four-cylinder motor; new top and wind shield; fine condition; bargain. O. C. Snyder, Bethlehem, Pa.

FOR SALE—Five-passenger Rambler surrey; new engine and new tires; price, $400, or will exchange for machinery; also runabout, all complete, with top, ready for power; price, $200; pressed steel frame, 104-inch wheel base, $25; four-horse stationary gasoline engine $75. Address Central Supply Co., Richland, Pa.

FORD RUNABOUT OWNERS—Modernize your car with Rumble seat and trunk, $15. Glass front, $12; 3-hinged folding hood, $8; roadster fenders with brass-bound running board, $12. Discount to dealers. State your wants for catalogue. Auto Rebuilding Co., Chicago, Ill.

FOR SALE—Steam Automobiles; write for illustrated bargain list. F. W. Ofeldt & Sons, Nyack, N. Y.

FOR SALE—Six-cylinder automobile coil, 14 h. p., 4-cylinder, 4-cycle, air-cooled automobile engine. Set of 3x28 inch solid tires. A 6, 8 and 10 h. p. stationary engine. Low price on the above. F. Booth, Stanley, N. Y.

FOR SALE—3 h. p., air-cooled automobile engine, in good running order; $20. Clyde Parker, 1604 Lincoln avenue, Kalamazoo, Mich.

FOR CASH OR EXCHANGE, for Model No. 10 Buick and pay difference, 1906 Model F Jackson runabout, as good as new; will sell cheap. F. M. Groschner, Perry street, Napoleon, Ohio.

FOR SALE—New black motor buggy; cost $575; sacrifice $350; also two-cylinder motor, $30; transmission, $15; running gear, $20; other parts cheap. Address E. E. Sage, Bolivar, N. Y.

STEAM CAR OWNERS—Subscribe for Steam Motor Journal, monthly devoted to steam cars. 1409 Welton street, Denver, Col. Price, 15 cents; $1 year.

FOR SALE—4 Syracuse marine motors; slightly used for shop demonstrations; 8, 12 and 16 h. p.; at second-hand prices. Syracuse Gas Engine Co., Syracuse, N. Y.

FOR SALE—$75 takes my 15x4¼ gasoline launch, propelled by Holly 3½ h. p. engine; new last spring. Address Ralph Tice, Dowagiac, Mich.

UNIVERSAL FLUXINE brazes castiron; guaranteed; any one can do this work with regular brazing equipment. Send 50 cents stamps or currency for pound. Universal Fluxine Co., Urbana, Ohio.

STOP MISSING—Save batteries; exchange your old coil for a new one; any standard make; liberal terms. American Coil Exchange, 308 Fourth avenue, New York City.

$400 BUYS 16 h. p., 2-cylinder Yale 5-passenger car in good second shape; good compression; runs quiet; ready for long tour; rear entrance; three years old. Cost $1,600. Would take a turning lathe as part payment. C. W. Lindsay, Anthon, Iowa.

FOR SALE—Engines, axles, transmissions, frames, bodies, carbureters, timers and auto parts generally at bargain prices. Tell us what you want. The Logan Construction Co.

REBUILD YOUR CAR into "Gentleman's Roadster." We make latest style hoods, radiators, tanks, fenders, "hood dashes," glass fronts, auto trunks, Rumble seats, etc.; 20% saved. Your old car re-designed free. Hood and Dash outfits for '03 and '04 Ford, Cadillac and Winton in stock. Smashed lamps and radiators repaired like new. State your needs for catalogue. Auto Rebuilding Co., Chicago, Ill.

FOR SALE—Four wheels, four axles, six springs, body, 30-gallon copper tank, runabout without power. Address B. H. Merrick, Stratford, Conn.

TOPS—Until further notice, runabout tops $20, touring car tops $35. C. G. Meyer & Son, Tiffin, Ohio.

FOR SALE—Oldsmobile runabout in good running order. Price $100, if taken quick. Address G. E. Burrows, Rapid City, South Dakota.

15-PASSENGER, 40 h. p. motor cars; three of them made by the Chicago Motor Vehicle Company; need overhauling; will sell cheap if taken at once. J. W. Chadwick, Lawrence, Kan.

FOR SALE—Set of 4 new 36x3 solid tires. Price, $50 per set. Address R. Roth, 1423 North avenue, Bridgeport, Conn.

FOR SALE—Two "Slama" tire protectors, 32x3½; used once; are as good as new. $15 each. No car for them. C. W. Keys, Wilsonville, Neb.

FOR SALE—Two-cylinder vertical engine; 12 to 14 h. p.; in good condition; with Kingston carbureter; Herz timer; rotary pump attached for $75, if taken at once; cost $227; made by the Continal Motor Mfg. Co. Address J. H. Kindig, Huntington, Ind.

FOR SALE—12 h. p. opposed engine, with transmission coil plugs and carbureter; $100. Address H. L. Lane, Zanesville, Ohio.

FOR SALE—Steam automobile engine, $5 to $50. Address George H. Platt, Sedgewick street, Bridgeport, Conn.

No Skidding or Punctures.—The Beebe-Elliott Company, Racine, Wis., say that those who use Ke-Pa-Go-in Tires need not fear skidding or punctures or various other troubles. Write for further particulars and mention The Automobile Dealer and Repairer.

Care and Repair of Tires.—This is the title of a booklet of 24 pages, brought out by the C. A. Shaler Company, Box Z, Waupun, Wis. They say that the book contains "a remedy for every conceivable tire emergency," and that it is the only book of the kind ever published. We understand that a copy will be sent free of charge to any reader who writes for it and mentions The Automobile Dealer and Repairer.

Lacoste Commutators at Bargain Prices.—We wish to call special attention to the full page announcement from the Lowell-McConnell Manufacturing Company of Newark, N. J., which appears on our outside back cover this month. They offer the well known Lacoste Commutators at phenomenally low prices. But readers should write them at once, not forgetting The Automobile Dealer and Repairer.

The M. M. Generator.—This generator is made by the M. M Generator Company, No. 1 Madison avenue, New York City. They say don't buy and throw out dry cells, or fuss with storage batteries or experiment with bad magnetos, but investigate their igniter system. In writing for further particulars mention The Automobile Dealer and Repairer.

We have received from the Heitger Carbureter Company, 205½ West South street, Indianapolis, Ind., a booklet describing in detail their carbureter which is adapted to the use of two or four-cycle engines, automobile, marine, stationary or motorcycle. The booklet is illustrated and gives full particulars. In writing for it mention The Automobile Dealer and Repairer.

Eastern Self-Measuring Pump

Our 1907 Model, shown herewith, will quickly pay for itself in any garage.

Convenience, Economy, Safety.

Not one drop of Gasoline wasted.

Gasoline Tanks, Pumps, Complete Storage Outfits.

Get full information by writing to

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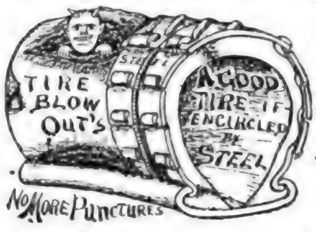

Tires Will Last Forever

Steel Link Bands

Hooks to Rim

You can fix Blowout quick. If tire is completely covered by these clasps you cannot have Blowouts, Punctures, Rim Cuts or Wearing off of tire. (Any old tire is good. How can it get away if encircled by steel?) As flexible as ever. Anti Skid.

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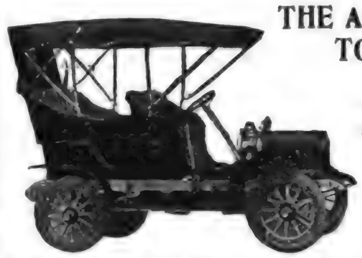

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To Keep the Motor Motoring Use

Dixon's Motor Graphite

It makes better compression in cylinders, prevents cutting of bearings, lessens gear wear and noise. Write for free "proof" sample.

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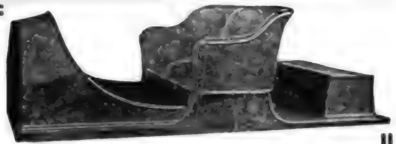

Running Gears, with pressed steel or angle iron frames, also chain or shaft drive. Any wheel base up to 120 inch, and any height of wheels.

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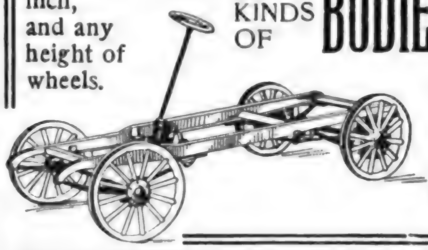

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Makes the repair permanent, as it produces the same effect as vulcanization. The acid cures the cement to the rubber or part to be repaired, which makes it one solid piece of rubber and impossible to separate.

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Heat will absolutely not affect a repair made with this Cement. and Acid Cure Solution. Absolutely not injurious to the finest quality rubber.

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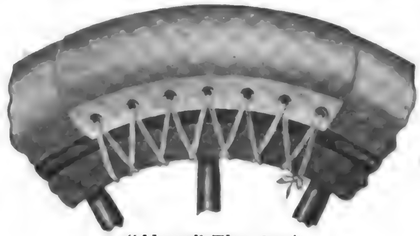
Ask your dealer or write direct. We make regular inner tube patches, six sizes.



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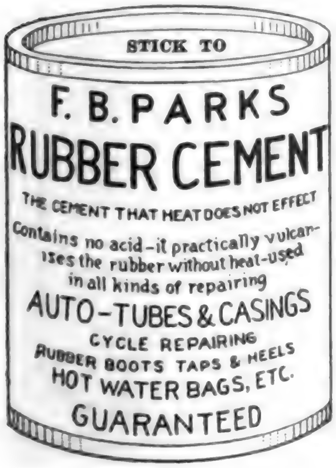

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VOL. VI., NO. 5. NEW YORK, JANUARY, 1909. PRICE { 10c. PER COPY / $1.00 PER YEAR }

FOLDING EXTENSION TOPS.

How to Turn Them Back Properly Illustrated From Photographs.

BY G. J. MERCER.

It does not take long to spoil a folding top if it be folded improperly or carelessly, and if folded and handled properly, a top will look well and last for a long time. Of the illustrations, Fig. 1 shows Franklin model

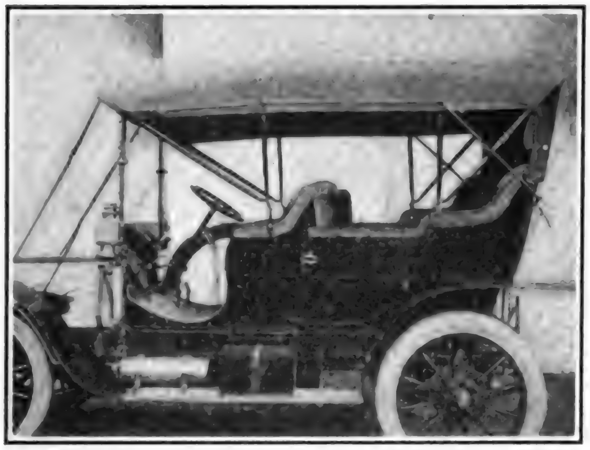

FIG. 1.

D top, which is made of double faced auto cloth, second growth ash wood bows, reinforced steel bow sockets and top joints.

They adhere to the use of side joints on their larger tops on account of the benefit that is derived from always having the top in the same shape as it was originally con-

FIG. 2.

structed. These side joints with the addition of the strap in front make as near a perfect working top as it is possible to have. The object in demonstrating the folding of the top in the accompanying pictures is to impress upon the average car owner the necessity of properly folding the goods that cover the top. It is just as essential when closing up the top that the material be properly protected from any cutting parts as it would be in the case of a suit of clothes. On account of the awkwardness of the top, very few people succeed in practising the correct method of shifting it from its open to its closed position and vice versa.

Fig. 2 is the first position, and by the way it is much better for two to perform this operation; one being on

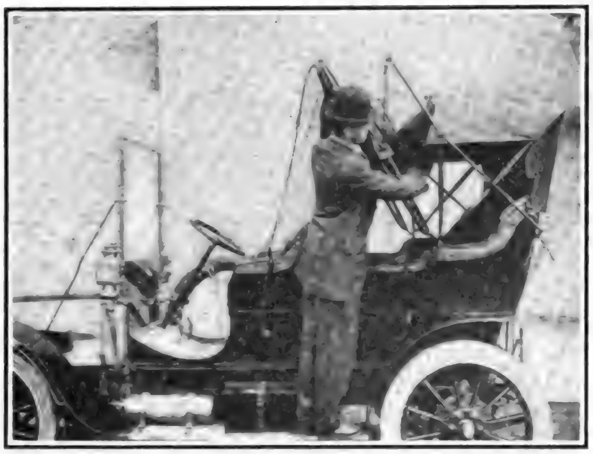

FIG. 3.

each side. You will note that in this, as in the succeeding pictures, the main stress is laid upon pushing the loose material toward the center of the car and away from the parts of the bow that will naturally come closer together.

Figs. 3 and 4 are demonstrations to the same effect and Fig. 5 shows the top properly strapped down already

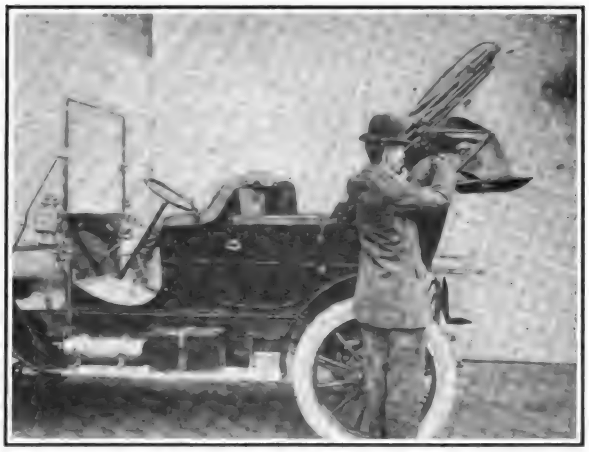

FIG. 4.

to receive the dust cover. This, by the way, should be a complete envelope and to entirely cover all parts of the top material and should be as snug fitting as it is as possible to be and be put on and removed readily. Care should be taken that the retaining straps are put firmly

over all the bows when the top is in its folded position. This will prevent working of the parts, chaffing and possible cutting of the material. In possibly 75 per cent., if not more cases, where the life of the top has been shortened, it is due to improper fastening of the top when folded. It is well to remember that water-proof material that is safe to use for a top of this kind has never been made and probably never will be that will not show the creases or marks where it has been folded, therefore, no one thing will add so much to the life of the top as to fold it as little as possible, or when folded, be sure that it is carefully done. The majority of material of which

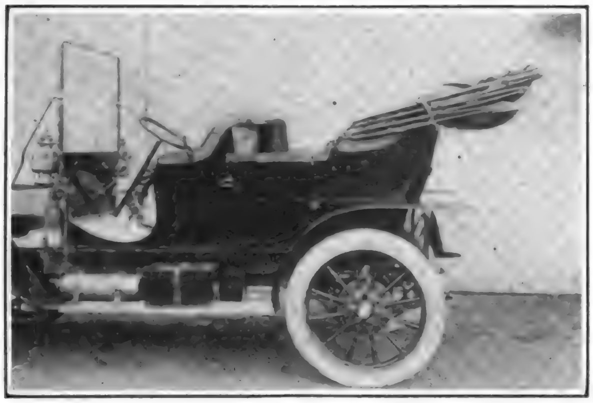

Fig. 5.

tops are made will be benefited when first opened up after having been closed for some time, by being allowed to stand in a soft sun light. This will tighten the goods by shrinking and invariably remove the creases or wrinkles.

Another feature that we have incorporated and that has given general satisfaction has been the fastening of our side curtains and storm front to the underside of the back bow. These curtains, after being neatly rolled, are held in position by four straps. This is much better than the usual method of folding and putting them under the seat cushion and also obviates the cracking of the celluloid lights.

The Weight of Cars.

In estimating the weight of their cars most manufacturers do not include certain equipments and accessories which must be carried whether they are included or not, and the power must push them and the highway hold them up.

Among the equipments not generally included by manufacturers are these articles and an approximate weight estimate: Shock absorbers, 28 pounds; odometer and fitting, 2 pounds; foot-rest, 7 pounds; robe rail and brackets, 5 pounds; dash cabinets, 3 pounds; luggage carrier in rear, 17 pounds; tool box in rear under frame, 26 pounds; sprag, 12 pounds; rubber bumpers, 2 pounds; rear axle straps, 2 pounds; gasoline gauge, 1 pound; total, 124 pounds. In addition to this with many cars are given tools and spare parts amounting to 55 pounds, making the total 179 pounds of accessories.

Aside from the actual mechanism and body of the car there are extras such as cape top, 138 pounds, and the glass front, 44 pounds, that count in the actual weight of the car. Water, oil, gasoline and grease add another 220 pounds, making a total with the accessories of 581 pounds.

THE STEERING GEAR.

Some of the Defects That Cause Trouble and Which Might Be Remedied.

Notwithstanding the improvements which have been made in automobile mechanism during the past ten years, the steering gear which is in some respects the most vital part of the whole structure, remains practically the same as at the first. Although it answers well enough if of sufficient strength, kept in order and used properly, yet on most cars the details are not what they should be to withstand hard usage—to be fool proof—so

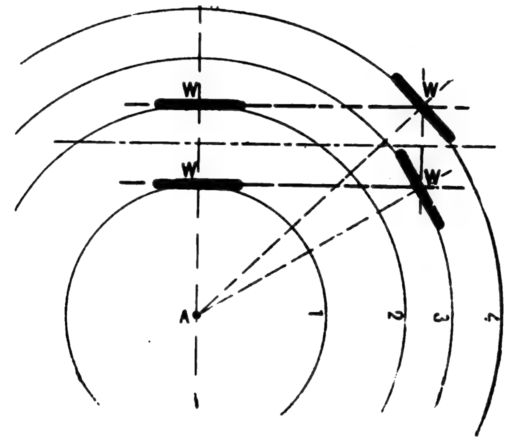

Fig. 1.

to speak. The number of accidents due to defects in steering gear is excessive, even allowing that the tendency to place the blame on it is often unjust. The theory of the articulate axles as now generally used is correct, but in practice it does not quite meet the requirements.

In the first place, if a four-wheeled vehicle is to move in a circle or part of a circle, and if each of the four wheels are to roll naturally without any skidding, each

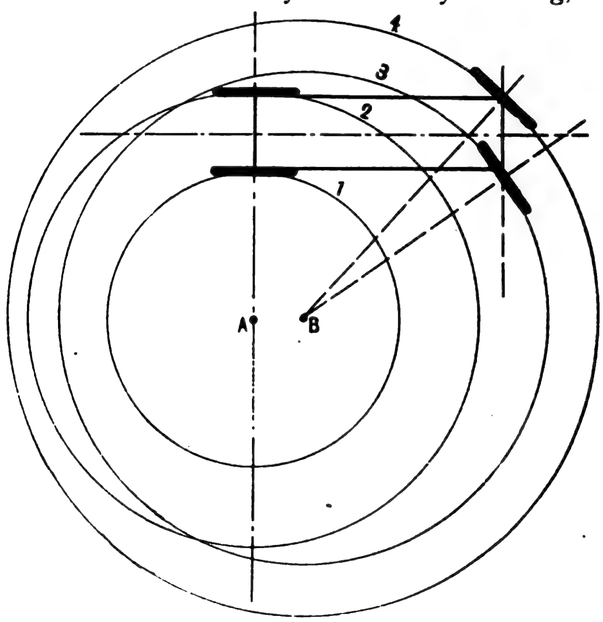

Fig. 2.

wheel, considered separately, must roll round in a circle, the center point of which must also be the central point of the circles in which the other three wheels roll. Or, in other words, the four circles or tracks in which the four wheels roll must be concentric. See Fig. 1. Now in the average brake this is approximately true only, for though the back wheels always roll in concentric circles because they are carried on the same axle, neither of the

front wheels can roll unless the point of intersection of the center lines of their hubs lies on the center line of the back axle. For the point round which the back wheels turn must lie on the center line of their axle, and if the point round which the front wheels tend to turn is not on this center line, then of course the back and front pairs of wheels are trying to turn in circles which are not concentric, and therefore skidding must take place. See Fig. 2. When the tie rod arms of the stub axles are so set that their center lines intersect at the center of the back axle, as shown at Fig. 3, then the steering is bad, and very considerable skidding takes place, which is not so much to be avoided on account of the naturally destructive action on the tires so much as on account of the strains thrown on every portion of the steering connections. The inaccuracies of the principle can be to a great extent overcome by making slight alterations in the exact arrangement of the connecting links. Of course there have been many different adaptations of this system suggested and tried, but most of them have not succeeded in overcoming the difficulty outlined. But the arrangement as shown at Fig. 4 gives perfect rolling at all locks which are possible on a rear wheel driven vehicle. This arrangement as shown has the tie rod divided at the center, where a joint connects the two halves to

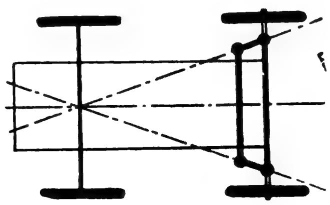

Fig. 3.

each other, and also at the end of a short arm swinging on a fixed point which might be carried on a projection from the fixed axle. To this short arm the steering rod is attached by the usual means.

There is still another fault of the ordinary arrangement which is far more important than the mere question of the correct rolling of the wheels at all degrees of the lock. With an articulated axle, in which the centers of the hubs are outside the centers of vertical steering pivots, as is, with one or two exceptions, always the case, the resistance of the road continually pushing against the front wheels tends to turn the stub axles on their pivots. Or, in other words, the whole time the car is running the front wheels are trying to spread, and should the tie rod give way or one of the pins come out, the wheels do spread instantly, and an accident is pretty sure to follow. In a few cars at first, the front wheels were carried in forks of bicycle pattern, each wheel having a

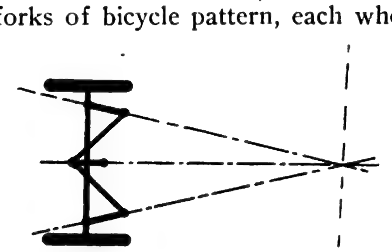

Fig. 4.

steering head above it in exactly the same pattern as a bicycle. The two fork heads were, of course, linked together by a tie rod. Now with this arrangement, the center of the hub is in the same vertical plane as the center of the pivot, and there is no tendency for road shocks to twist the wheels. In fact, if the tie rod broke, the car would continue to run in a straight line, and owing to the effect caused by raking the front fork, the breaks might be applied without much danger of causing the car to swerve.

To make manifest in the simplest manner the difference between such an arrangement and the ordinary design, it is only necessary to picture one of the old-fashioned tricycles in which the front wheel instead of being between the forks, is set to one side. The continual strain on the handle bar can be better imagined than described, and this strain, vastly greater on account of the weight and speed of the vehicle, is exactly what is being sustained by the tie rod and joints of an ordinary car.

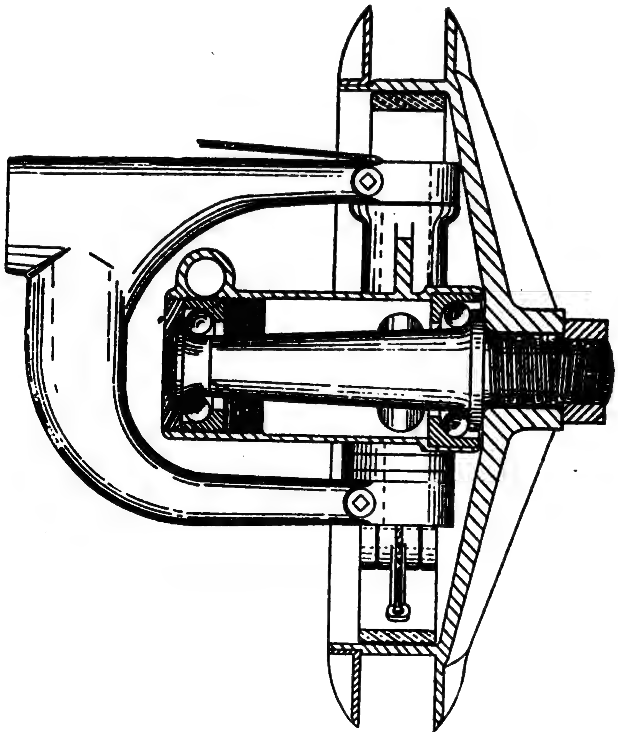

Fig. 5.

No wonder that in such cases the joint pins wear out rapidly. Again, even if the tie rod is intact, with vertical pivots there is no stability to the axle. There is no action like that of a caster, and the wheels can stand in the position of full lock just as easily as they can in the straightforward position. Therefore if the steering rod fails, the wheels will turn just as soon as one of them meets with greater resistance than the other. If the pivots are raked slightly, as for instance in the case of a bicycle head, then the action of a caster is obtained, and the wheels will tend to run straight, but such rake causes the whole car to lean outwards on a curve, so to speak, which is scarcely desirable. Of course the front fork and bicycle head design is not applicable to modern cars on account of their weight, but there are two devices which give the same effect—one the old Duryea axle and the other a patent foreign hub. In the Duryea axle the pivots are inclined in the vertical plane of the front axle, so that the center line of the pivot strikes the ground at the same point as the wheel tire, as shown at Fig. 5. Here again the wheel turns about its point of contact with the road, and has no tendency to be deflected by shocks, but the design suffers from the disadvantage that the car is very slightly tilted in the wrong direction on curves. However, it is perhaps asking too much of the manufacturer that he should adopt any arrangement that is not embodied in standard practice, but if the ordinary front axle is to remain as it is at present, automobilists may reasonably demand that greater care be taken over the design of the details of the steering.

As every road shock tends to deflect the wheels, it is

necessary to provide some mechanism which will resist such deflection without throwing the strain on the arm of the driver, and this is most easily accomplished by the use of the customary worm and sector gear. This gear is not really actually reversible, though it is usually described as being so, and, as a matter of fact, if a really reversible gear is fitted, the steering is very uncomfortable. The worm and sector is one of the best of mechanisms, although it is so seldom made strong enough for the work it is called upon to perform. It need not be stated that any steering gear will wear out more rapidly at the center of the motion than at the extremes, and therefore it is impossible to provide a positiye adjustment which will take up wear at the center without making the gear stiff on the locks. Why would it not be better to make the worm and sector twice the size they are usually made? There is usually room enough in the chassis, and if made larger, they would be stronger, wear out less, and be more substantial in every way.

Then again, the gear is often not given sufficient care in the matter of machining or assembling, and consequently looseness or stiffness are the rule, rather the rule than the exception. Also it may be added, the worm should be properly supported and provided with adjustable thrust bearings. In quite a number of gears the only bearings are at the extreme ends of the steering column, and when this is the case the spring in the tube of which the column is made will allow the worm to spring partly out of mesh with the sector, and when there is no adjustment to the thrust, as soon as a little wear has taken place not only will there be lost motion, but the worm will be able to move up and down slightly, causing rattling in the box accompanied by snatching at the wheel.

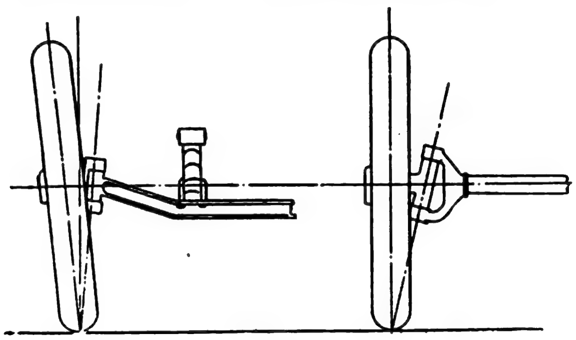

Fig. 6.

But assuming that the gear itself is incapable of improvement, there still remain quite a number of details which are usually badly designed.

Firstly, the joint pins of the tie rod are seldom large enough, also the forks at the ends of the rod are frequently weak, and it is only in very rare instances that any adjustment or proper means of lubrication are provided.

Even though the actual motion about these pins is small, there is a continuous strain the whole time the car is running, which strain varies as the road shocks vary, and the constant blows on the pins are equivalent to quite a considerable amount of motion. It is hardly necessary to describe the methods by which these joints can be improved, it is simply a question of spending a little extra money in the first instance, but the amount is so small by comparison with the total cost of the car and the importance of the parts is so vital, that the wonder is manufacturers can afford to neglect them.

Many steering accidents have doubtless occurred through one or the other of the ball joints becoming detached, and there has recently been much discussion on this subject. It may be allowed that considerable improvements in this portion of the steering mechanism have recently been introduced, but some of them are unnecessarily complicated, and many cars are still fitted with the old-fashioned joint in which, if the locking device fails and the cap unscrews, the ball is immediately freed and the car rendered unmanageable.

The advantages of the ball joint in comparison with the pin universal is that it is easy to make it so that the wear is automatically taken up by springs. The ball should always be fitted on top of the stub axle arm and at the side of the steering lever, so that the steering rod will

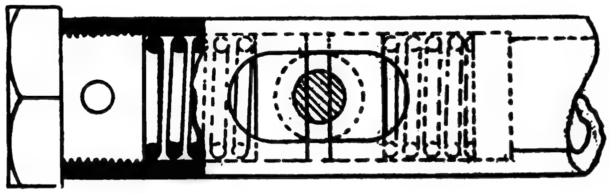

Fig. 7.

not easily drop off if the balls become loose in the cups. Assuming that the most convenient tubular ended rod is used, there are two ways of inserting the ball; the first is illustrated in Fig. 7, and may be called the old standard type.

Here the tube is slotted so that the ball can be pushed in from the end together with the cups. There are numerous ways of locking the cap in position, but it can never be screwed up tight on account of the tube being split, and all locking arrangements are liable to failure. Even when a large split pin is put right through cup and tube, the joint is not absolutely secure.

The other method is to make a hole in the side of the tube sufficiently large to admit the ball itself. One cup is put in from the end; the ball is then inserted and the other cup locked in place. This joint is better than the first described, because the cap can be firmly screwed up in the first instance, and if sufficiently powerful springs are placed behind the cups, even if the cap comes off together with the outside cup, the ball will be unable to escape from the tube, being nipped between the back cup and the side of the hole in the tube (see Fig. 8).

Of course, with this joint breakage of the back spring, accompanied by the loss of the cap and outside cup, would render the joint useless, but, though there are several much more costly and complicated devices in use, scarcely any of them are more reliable than this type.

The security of all of them depends on something, and generally a small something; therefore it would be advantageous if a totally separate connection could be made between steering lever and stub axle arm—a connection which would only come into action when the ball jointed rod failed.

All the minor faults of steering mechanism, such as twisting of the road wheels without movement of the hand wheel, spring in the connections, backlash, and consequent snatching at the wheel, are due simply and solely to the designers not realizing the immense strains to which every portion of the gear is subjected.

Unfortunately, the weakness is not confined to the joints alone; the usual tubular connecting rods are none too strong, and breakage of the stub axle arm sometimes occurs, particularly where it is made to carry both the connecting rod and tie rod. Where springs are employed they are seldom of sufficient strength; tie rods, connecting rods, levers, and the worm gear itself, each and all have a heavy load to carry, and they are rarely strong enough to carry it without a considerable amount of springing and bending, rendering the steering uncertain

in action and very uncomfortable when running fast over rough surfaces.

A typical example of careless fitting is the frequency with which cars will lock over further on one side than on the other; the stop which limits the motion may occur at any part of the gear, but it is usually in the worm box, and it is only necessary to set the sector properly to obtain equal lock.

Also if the steering lever is not vertical and if the stub axle arm is not at right angles to the connecting rod when the road wheels are in their middle or straight position, a definite motion of the steering wheel will give a different motion of the steering wheel will give a different degree of lock, according to the direction in which it is made.

Another effect is what is best described for want of a better term as flapping of the front wheels. With almost every car there is a particular speed at which this action will be most pronounced.

If the wings are removed it will be seen that the wheels can wobble from side to side to some considerable extent without in any way disturbing the hand wheel, and this even when there is no slack in the joints. It is partly caused by spring in the connections, but is also due to an entirely different action. As the rear springs give to a bump, the frame approaches nearer to the axle, and as it recovers its original position the ball end of the steering lever will move up and down in a vertical line. The ball end of the stub axle arm cannot move similarly, and so it is forced to move to and fro, and the wheels must, of course, move likewise, so that when a continual bouncing is going on the wheels will flap.

The shorter the connecting rod the more pronounced will this action become, and it need scarcely be added that

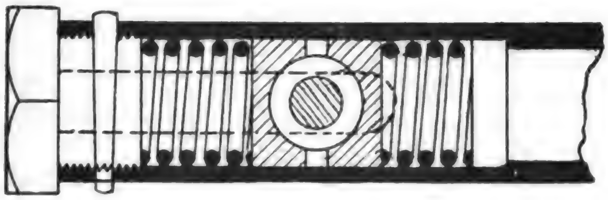

FIG. 8.

such flapping tends to make the steering erratic. The fashionable large rake to the steering column necessitates a short connecting rod, and thus flapping is usually worse on new cars than on those of older pattern.

THE IDEAL STEERING GEAR.

Ideal steering would not require an irreversible gear, as it does not require to be held forcibly against the resistance of every inequality in the road. All that would be required is a reduction gear, so that the ratio between the motion of the hand wheel and the road wheels should be comfortable in use.

The reduction gear and all joints in the connections should be adjustable, and, if possible, automatically so. The same precautions would have to be observed in the design of the ball joints, as should be the case with the usual steering system, and the same precautions would have to be taken to prevent flapping; but none of the parts would be subjected to anything like the same strains as are entailed by the ordinary axle, and would be amply strong enough if made of about the same dimensions as at present. It seems as if among the crowd of manufacturers searching their cars for some small detail of which to make a talking point, a few might be found who have sufficient courage to make a radical departure from traditional designs, and build a car which is really safer to drive and easier to handle than is the standard car of to-day.

Car Against Horse.

Figures comparing the cost of running an automobile with those of keeping a horse are not of conclusive character because so much depends upon circumstances, but they are somewhat interesting and instructive.

T. H. Proske, who lives near Denver, Col., decided that he would substitute an automobile for the family carriage used chiefly between the farm and the city and he made the experiment one of careful bookkeeping covering a period of 18 months. The record with the original cost of the vehicle is as follows:

One set of tires	$ 130
Less credit for old one taken in exchange	35
	$ 95
One overhauling and varnishing	$ 35
Average cost of gasoline, oil and batteries per month, $12—18 months	216
Original cost of motor car	3,040
Total	$3,386

This is based on a daily average travel of 35 miles, running with his 28 horsepower Franklin. Later he decided to buy a 42 horsepower machine of the same make. He finally sold the original car at the end of the 18 months for $2,250, thus bringing the net cost down to $1,136, or a little more than 5 cents for every mile traveled.

Satisfied that the original cost of horses and carriages to do the same amount of travel would exceed the original cost of the automobile. Proske figures the upkeep for horses and coachman as follows:

Feed for two horses, per month, $35—18 months	$ 630
Coachman, boarding himself, per month, $75—18 months	1,350
Total	$1,980

"This," he remarks, "is not making any allowance for repairs to carriages or depreciation or possible death of horses. It will be seen from that that even if there was no sickness or death of horses and no depreciation in equipment I am still $844 ahead on the deal." This result is reached by deducting from the $1,980, which maintenance of a carriage would cost, the $1,136 which the automobile actually cost for 18 months. Incidentally the second experiment developed the fact that the upkeep cost of the second and larger car exceeded that of the first by not more than 10 per cent.

Tires in Winter.

Here is a suggestion for preserving tires in winter: For the front tire, cut off the rim of an old outer cover and slip it over the tire in present use. The grip of the old tire will be sufficient to prevent the cut one from slipping. As for the hind wheels, it is generally necessary to cut holes in the cut cover and tie it to the spokes of the wheels to prevent slipping. Of course, the going will be a little more heavy, but the saving of the tire bill would more than compensate this. It would be very interesting to hear from any other reader of any efficient ways of saving this great item of expense.

Sign of Weak Batteries.

One way to tell your batteries are getting weak is when your motor speeds up nicely when the car is standing still, and misses fire when under load. This is a sure sign of weak batteries. It is a good plan to use the two sets alternately. One weak cell will spoil a whole set.

Automobile Dealer and Repairer

A Magazine of condensed and compact information for busy readers.

OFFICIAL ORGAN OF THE NATIONAL RETAIL AUTOMOBILE DEALERS' ASSOCIATION

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ADVERTISING RATES MADE KNOWN ON APPLICATION

NEW YORK, JANUARY, 1909.

Missing Numbers—Our readers are requested to remember that it always gives us pleasure to re-send numbers which have gone astray in the mails.

THE RETAIL DEALERS.

As will be seen by notices elsewhere in this issue, THE AUTOMOBILE DEALER AND REPAIRER has been made the official organ of the National Retail Automobile Dealers' Association, and it will hereafter contain, so far as is practicable, its official communications and such other matter as may be of interest to its members.

The advantages, or rather the necessity, of an organization of this kind and of a medium through which its members may express their convictions and the result of their experiences concerning the trade and its interests, need not be gone into here in detail.

The marketing of cars and of their accessories is a new business and by far the largest and most important that has ever sprung up at once in the history of this country or any other. In an age when even the most thoroughly established mercantile and industrial lines have found it essential to operate jointly with others or go to the wall, the necessity for such a step in the case of anything that is to occupy a new and an extremely broad field, need not be emphasized. The manufacturers of cars found it imperative at the outset to take steps toward co-operation, and this has been gradually growing closer and closer, although it has yet nowhere near reached its limit.

The retail dealers have far greater reasons for concurrent effort. With a dog-eat-dog policy as to the discount on cars, the deposits on car contracts, the handling of second-hand cars, and of the question of car demonstration as well as of demonstrating cars, to say nothing of the menace of catalogue houses which have exercised a withering blight upon every industry they have touched, the legitimate, upright and business-like dealer may as well get out of the business first as last.

Although the foregoing is from the standpoint of the retail dealer alone, the final outcome is just as important to the car manufacturer and to the general public. Responsible personal effort and personal contact are important to the manufacturer in more ways than one. They mean satisfied purchasers and the supplying to the utmost extent the public want. And to the general public welfare they mean the difference between the conduct of a great industry upon legitimate and business-like lines and upon destructive lines.

It need hardly be stated that if there is anything in the foregoing that is not in accordance with correct reasoning and with the facts, then we shall welcome in these columns a correction by manufacturer, dealer, and any one interested.

We have no opinion nor conviction that we will not cheerfully exchange for the truth.

AUTOMOBILES AND THE ROAD.

We have contended more than once in these columns that automobiles are not especially damaging to macadamized roads, unless they are provided with chains which tear the roads. There cannot be much abrasion from a rubber tire, and without abrasion the road is not injured except by suction of the loose road material.

It is the steel shoes of horses and the steel wheels of horse drawn vehicles that grind up the roads, and all the automobile does is to stir up the dust thus made and enable the wind, when there is a wind, to blow it away.

Municipal officers do not take kindly to this theory, because in too many cases they are anxious to condemn the automobile whenever it is possible to do so.

In the issue of the *Country Gentleman* for December 3d appears a communication on roads by A. A. Young of Connecticut, who says among other things:

"Fast moving automobiles certainly do raise dust, and if the wind is blowing, the dust is carried off the road into the fields; but the best road makers tell us that the road should be kept free from dust, as dust makes mud in wet weather. It would rather seem from this that the automobile is a help to the caretaker on a macadam road. But aside from this, would the automobile raise dust if none existed on the road? As before mentioned the best road engineers hold dust to be a detriment to a macadam road, but yet all agree that the dust comes from the road itself. Why? Because the material with which the roadway is surfaced is not 'bonded' and the wheels of traffic cause a certain amount of movement in the unbonded places, which movement causes abrasion."

It will be seen from the above that this writer does not take into account the trouble which we have already referred to, caused by horses' shoes and steel tires, but he does recognize that the automobile is not injurious to macadam roads except as stated.

STEAM AND GASOLINE.

The discussion going on in these columns in relation to the comparative merits of gasoline and steam cars is interesting. We should like more of it. In a multitude of opinions and experiences there is wisdom.

There are, of course, good points in each vehicle. The gasoline car has the advantage of greater power for a given weight and smaller fuel consumption for equal power. It is also simpler in construction. This, we think, will be generally admitted. As a matter of opinion, we believe it is more easily kept in order, but possibly this may not be so conclusive. The gasoline car is likewise more accessible for repair and adjustment.

On the other hand, the steam car has the advantage of greater flexibility. It can be started from rest and stopped and made to move very slowly or rapidly by merely admitting steam or cutting it off. This is not the case with a gasoline engine or car. With wide limits of speed, no substantal variation of mean pressure on the piston follows a change from high speed to low speed.

If we assume that a gasoline engine is running at 1,000 revolutions per minute under a mean effective pressure of

90 pounds per square inch, developing an indicated power of 40 horse power; then if the speed be dropped to 500 revolutions per minute, the mean pressure of 90 pounds will remain practically unchanged. If the valves are properly proportioned there will be no material change in mean pressure. But the engine will then indicate but 20 horse power. To make the flexibility as it should be, 40 horse power should be developed, but to do this 180 pounds pressure would be necessary.

As to the steam engine, it may consume the whole of its supply either at a high or a low speed. And suppose we take the same speed variation as in the case of the gasoline engine mentioned, 1,000 and 500 revolutions per minute. At the high speed, a given point of cut-off will utilize the whole steam supply, and give 40 horse power at 90 pounds mean pressure. At the low speed of 500 revolutions, the cut-off must be later to use the whole steam generated, and then the steam weight used per revolution will be doubled; the mean pressure will not be doubled, but it will be greatly increased. If it rises from 90 to 150 pounds, then the indicated horse power at half speed will be 33 1-3. The steam engine thus possesses considerable, although not ideal, flexibility.

Complete flexibility in a motor requires the property of producing maximum power at both high and low speeds, and this property is to some extent present in the steam engine, and almost absent in the gasoline engine. What is commonly called flexibility in a gasoline motor is in reality controllability, which is different.

Recent improvements in the gasoline engine, such as very large inlet and exhaust valves and very light pistons and moving connections, have made it possible to greatly increase the total power to be obtained from cylinders of given dimensions by permitting of longer strokes and higher speeds of rotation, while keeping up the weight of charge per stroke.

There are other points worthy of consideration, such as safety, smell, silence, and speed, but these depend so much upon conditions and circumstances that they need not be discussed here. The experience of those who have used both gasoline and steam cars is worth much if they will express themselves candidly, and it is from such that we like to hear.

IDENTIFICATION DIFFICULTY.

There should be some easy and sure way to identify a car where the driver tries to escape after having done some unlawful damage by running over some one or doing other injury.

The registration number is altogether inadequate for such identification. Even though it were compulsory to make it twice the present legal size, it would be no use in a cloud of dust or in the darkness of the night. And in case there is no obscuring dust or darkness, some other intervening object or a sudden turn in the road is likely to prevent identification, if the driver of the car tries to escape it. Cases have been known where unscrupulous, not to say criminal, drivers have deliberately covered the registration number in order to escape the penalty for some flagrant offense. In his annual message, the governor of New York says:

"The reckless disregard of human life that is so frequently manifested in the driving of automobiles calls for drastic measures of protection, both with regard to means of identifying vehicles and in providing an increased punishment where those guilty of criminal conduct seek to escape arrest."

This is quite true, but how can it be done? As we have stated, the devising of better means of identification is thus far an unsolved problem, and while punishment of those who commit crime in this way should be more severe, and for those who do so and then try to escape the consequences, the penalty should be still greater, yet a step of this sort is likely to make the unscrupulous more desperate in trying to drive off without identification.

Car drivers are neither better nor worse than the public in general. They are good, bad and indifferent. Decent men or women will not attempt to shirk the consequences when they unintentionally injure a human being or destroy the property of another, and in the great majority of cases when an accident occurs, those responsible for it are only too glad to do all in their power to render assistance and are willing to stand the consequences. But how can the few who are vicious be brought to book?

When it is considered that the automobile is soon to be the universal vehicle of travel, and that as it will take away quite a proportion of the transportation that is at present being done by the steam railways, we believe the final outcome and remedy for a condition that is likely to become a greater rather than a less public menace, will be highways for automobiles alone. Under such a plan rules might be made that would be fairly just and satisfactory to all.

MENTION US.

As many of our readers are aware already, all the profit in a trade publication like ours comes from the advertising. In order to secure advertising, we must convince advertisers that our publication is of value to them, and the only way this can be done is for our readers, when when they write to an advertiser for circular or catalogue to mention that they saw the advertisement in THE AUTOMOBILE DEALER AND REPAIRER. We hope it will not be too much trouble for our readers to do this. They will confer on us if they will .

An Official Magazine.

To Members of the N. R. A. D. A. and Retail Dealers:

The officers of this Association have realized for a long time that there has been an urgent need for some trade journal to be adopted as the official publication for our Association and the retail dealers. We have gone into the matter carefully, and as a result we have selected THE AUTOMOBILE DEALER AND REPAIRER as our official magazine.

It is a paper devoted more to the needs and requirements of the average dealer than some others, and from now on the official communications of this Association will be found in its pages.

If you are not a subscriber, or a member of this association, it is time you should be; it is to your vital interest in dollars and cents to know what is going on and to be in position to secure the assistance and backing which our organization will offer.

Do it NOW. We need every bit of strength we can muster to combat the influences which are now at work against us. At the Chicago Show we want to have a membership enough to take a determined stand. Send in your application to-day.

C. F. JENSEN, *President.*
J. A. CRUM, *Secretary.*

The Dealers' Association.

The National Retail Automobile Dealers' Association is composed of active and progressive business men, and although at present it is not strong numerically in some parts of the country, being comparatively new, it does not

C. F. JENSEN, PRESIDENT

lack in enthusiasm nor knowledge of the needs of the trade. In an interview, Mr. Jensen, the president, said recently, that he expected excellent results for the Asso-

J. A. CRUM, SECRETARY

ciation this year, as dealers are beginning to find out the value of co-operation in a business which without it would soon be practically worthless. He added that he found manufacturers to be more favorably impressed with the idea of the organization than had been expected, the feeling being that it would result in averting destructive conditions, the omens of which were already beginning to appear. Mr. Jensen is frank to say that the reason he is spending so much time—not to mention money out of his own pocket—in furthering the interests of the Association, is because he wishes to see some steps taken to protect his own business or get out of it at once, and before he is absolutely compelled to. He says he is in the automobile business to get a living and to make something more than a living if possible, just as business men who invest in any other trade expect to do, and he sees no way to accomplish this without co-operation and a mutual exchange of views concerning the vital interests of the business.

Mr. Jensen is well known in automobile circles throughout the middle west. He is the junior member of the Steinhart Jensen Automobile Co., of Joliet, Ill., which has been in the automobile business for the past five years. He is also closely connected with a number of the commercial and industrial enterprises of Joliet, and is an energetic and up-to-date business man.

Mr. Crum, the secretary of the Association, is president and manager of the Kruger Automobile Co., of Oshkosh, Wis., and is highly esteemed in business as well as in other relations of life.

As will be noticed by reference to an advertisement on another page, THE AUTOMOBILE DEALER AND REPAIRER has been made the official organ of this Association, and its members are invited to freely use it as a medium for making suggestions for trade welfare and for the good of the Association.

LESSONS FOR DRIVERS.

Carelessness and Ignorance Responsible for Most Accidents.

Fewer automobile accidents are reported this month than usual. Whether this be due to a less use of the car in cold weather or to greater care in its running, we know not. Quite likely both causes have something to do with it, for it is injudicious to hope that the average of carelessness is much less when so many new drivers and owners are constantly entering the field. Not that beginners or those who are imperfectly acquainted with driving are the worst offenders in the matter of carelessness, by any means; sometimes the familiarity that comes from experience begets carelessness. But as a rule the quality of heedlessness and recklessness is inherent, and on the average the inexperienced driver does no more to swell the accident list than the class who drive from skill acquired from practical work. Although ignorance begets mishap, familiarity often breeds the same.

"A burned child dreads the fire." One of the best safeguards against accident is the accident that has already taken place. But of course there are exceptions to all this. Accident insurance companies have been watching closely the past few years to determine what part of their paid claims since 1904, when automobiles came into general use has been due to motor car accidents. The figures show that whereas the number of accidents increased between 1904 and 1907 not quite three-fold, the number of cars in use rose during the same time from 30,000 to 120,000, an increase of 400 per cent. That is, the increase in the number of accidents to the increase in number of cars has been as 3 is to 4. The figures prove conclusively that automobile accidents are becoming less and less frequent in proportion to the number of cars being operated upon the roads.

How much of the relative decrease in the number of accidents may be due to superior handling of cars, and how much must be credited to the improvements in car

construction and material, the increased skill of the mechanic who assembles the parts, and the hundred and one improvements which are being and have been continually adapted to cars to facilitate the work of the driver, cannot be learned from figures. It is probably safe to say, however, that a large degree of the increased expertness of drivers has been due to the mechanical aid rendered them by improvements in their cars.

Improvements are continuing steadily. From these causes and from others drivers are rapidly becoming more expert. It is probable that the number of automobile accidents of 1908 will be found to be fewer than those of 1907, in proportion to the number of cars in use in both years.

Here follows a few of the accidents reported during the past month, using those only where instruction or profitable deduction may be derived, and omitting such as were clearly not due to the carelessness of drivers themselves.

A Head-on Collision.—In New York City a car valued at $7,000 came in collision with a trolley car and was totally wrecked. The chauffeur was hurled out before the car ceased overturning and escaped, but the single passenger was buried under the debris. It was a case of reckless driving.

A Frequent Cause of Disaster.—Struck by an automobile as she stepped from a trolley car in front of her home in South Orange, N. J., a woman is severely suffering from injury and nervous shock. The chauffeur saw her getting off the car when it was too late. He applied the brakes and steered into a large tree on the sidewalk. This alone saved the woman from being killed.

Another of the Same Kind.—In Philadelphia as a woman in the shopping district was about to board a trolley car, an automobile came along and knocked her down, severely and perhaps fatally injuring her. Several bones were broken and she may have sustained internal injuries. The blame in this case is as usual upon the automobile driver.

Car Crashes Into a Store.—A big touring car in Chicago crashed through a plate glass show window before daylight in the morning and threw from their beds some people who were sleeping upstairs. Everything was pretty well smashed up, and there is evidence that the party had lost ordinary caution by being too full of red liquor.

The Wheel Skidded.—Near Stamford, Conn., a big automobile crashed into a group of five or six persons, and while all are injured, one may die. The driver of the car put on the brakes and tried to steer to one side of the street, but the wheels skidded and the automobile turned over. The driver is being held without bail, pending the outcome of the collision.

Met at a Street Crossing.—Two cars met at a street crossing in Fort Wayne, Ind., and as a result most of the occupants were hurled violently to the pavement and the cars were both seriously damaged. Neither was travelling at a high rate of speed, but it was fast enough so that one car was turned completely over and the drivers will have a lesson for future guidance.

The Axle Broke.—It is stated that the recent accident in Brooklyn whereby a well known young man was killed, the chauffeur badly crushed and others of the party seriously injured, was due to the breaking of an axle. Possibly this may be so, but as the car was being driven at the rate of 30 or 35 miles an hour and the darkness was so dense that nothing could be seen ahead, an accident might have been expected. The front wheel ran into a deep rut, and this snapped off the axle.

Two Killed in a Frightful Plunge.—While driving through Fairmount Park in Philadelphia, a physician and his chauffeur were hurled over a 35-foot embankment and both were killed. Those who saw the accident say the car suddenly swerved and headed directly towards the ravine. It crushed the railing along the embankment, and when found in the ravine below was bottom side up and completely wrecked. We object to the term, "the car swerved"; the car is passive. It is more correct to say, "the car was swerved"; it never swerves unless something or someone swerves it.

Ran Into a Telegraph Pole.—According to reports it seems to have been what is often termed "a joy ride." At all events a party of young men and young women in New Haven ran their car into a telegraph pole and completely demolished it. The occupants of the car were not very seriously injured, as is sometimes the case.

Skidded Into a Rut.—Near New Brunswick, N. J., a party was driving in the road, and to avoid a pedlar, attempted to turn out, but the car skidded into a rut, overturned, and there are a good many broken bones and brain concussions as a result. Fortunately no one was killed, but the car will never be used again.

The Escape of the Criminal.—In Newburyport, Mass., a car coming up behind a carriage struck it with such force that it was smashed. The driver of the car without waiting to see how much damage he had done, applied his power and made his escape. There is not much hope of ever apprehending him.

Left a Boy Dying.—A newsboy was run down by a large touring car in San Francisco and sustained such injuries that he soon died. The driver of the machine sped into the darkness, carefully avoiding street lights so that no one should detect the number of his car, and escaped. The police hope to finally apprehend the miscreant.

An Electric Spark.—A man in St. Louis, Mo., attempted to repair his car by the light of an electric lamp. In some manner the insulation of the wire to which the lamp was attached was defective, and as it dangled over the gasoline reservoir, there was a quick connection and a spark, the man was blown upward, but was not greatly injured. The car was completely wrecked and the fire department finally succeeded in saving the garage.

Defective Brakes.—Near Lexington, Ky., a car was run over a twenty foot embankment. The two occupants were killed. The only witness to the affair states that defective brakes were probably the cause of the fatality.

Careless Driving.—Near Chillicothe, Ohio, a man who is reputed to be a careful driver went too far to one side of the road, and as a result, the car toppled over an embankment and one young woman was painfully injured and disfigured for life. The balance of the party were bruised and shaken up. It should be stated that the lights on the car gave out, but it was running very slowly when the accident occurred.

Not Looking Ahead.—In Seattle, Wash., a car was being driven rather slowly, but the party did not see a man in front of them and application of the emergency brakes did not prevent carrying the victim 25 feet and seriously perhaps fatally injuring him.

The Wheel Came Off.—A prominent physician of Marietta, Ga., was seriously injured when the wheel came off of his car, wrecking the machine and throwing him violently to the ground. If he had given the car a careful examination before he started, the accident might have been avoided.

Another Skidding Accident.—At Whitman's, Pa., a powerful car skidded on the icy road for a distance of twenty feet and then upset. The occupants were thrown out and somewhat injured, and the tonneau was completely smashed, but the accident was less severe than might be expected considering the speed of the car.

Hit a Tree.—Near Providence, R. I., an automobile was carelessly swerved to one side of the road and struck a large tree. One of the occupants was thrown out and narrowly missed instant death, while the other was held in place by the steering wheel and not seriously injured. The car was badly damaged.

The Springs of Cars.

The automobile developed a new problem in springs. The earlier makers found it almost necessary to carry the mechanism above the springs in order to protect its many fragile parts from the road vibration, and this necessitated transmitting the power to the driving wheels through some flexible connection such as chains, or universal jointed shafts. Naturally, the makers sought to lessen their trouble by employing springs of minimum elasticity and greatest strength in order that they might the more safely carry the heavy and crude mechanism. As a result of this policy, the earlier motor vehicles were notoriously stiffly sprung and uncomfortable to ride in

The last year or two has brought about great changes. Propeller shafts and their universal joints have been lengthened and improved until they are no longer regarded as sources of trouble, and until they permit large amplitude of spring movement both vertically and sidewise, much as does the spring under the usual horse vehicle. While few riders stop to think of the effect of this rolling or sidewise movement of the body, it is none the less true that the vehicle in which this movement is permitted rides more easily and is not affected by any qualities at one side of the road or the other, as is a vehicle less flexible in this direction.

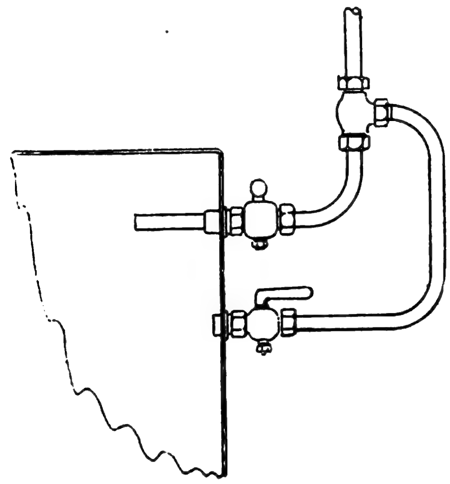
The mechanism itself employed in modern autos has been designed to withstand or to permit great wheel movement and spring action, so that springs to-day show not only great elasticity, but a great variety of forms. A few years ago the semi-elliptic spring fastened to the axle at its centers and to the body at its ends, was the common and almost generally accepted form. This spring permitted a vertical movement, but was practically rigid sidewise, and so served well to hold the axles in line with the mechanism and thus enable chains to follow the sprockets and transmit power in a satisfactory manner. The full elliptic spring, a most common form on horse vehicles, was not considered so satisfactory in auto work, because it had less sidewise rigidity, while platform springs, the most flexible of all, were not to be thought of.

This year will show a large variety of full elliptics, three-quarter elliptics and platform springs.

A Gauge Substitute.

Here follows the plan adopted by one car driver to enable him to know when his gasoline tank was becoming empty and also without one or other of the numerous gauges and other little things which are supplied for the purpose, and, although very good in their way, are far from infallible. It was simply thus:

There were two outlets from the gasoline tank which merged into one common supply pipe some ten or twelve



inches away, and each of these two outlet pipes was fitted with a tap quite close to the tank. The end of the outlet pipe in general use extended some three inches or so into the tank in a vertical position, the end of the other being flush, or nearly so, with the bottom, as shown in the sketch. The tap of the latter is religiously kept in the "off" position as a general rule, so that the driver has an emphatic reminder, by reason of his engine stopping, when all the gasoline in the tank except the last three inches has been used. By opening the emergency tap when such a predicament occurs and using the last three inches of gasoline it is a thousand to one the driver will be enabled to reach some place where a supply of gasoline can be obtained.

Freezing Dangers.

In using a glycerine non-freezing solution it should be remembered that as one's cooling fluid gradually cools down after a run, the glycerine takes its specific position, sinks, so to speak, and occupies only the lower strata of the fluid in the various portions of the tank, radiator, tubing and jackets. There it is useless; when once a perfect solution is unbalanced there is just as much likelihood of freezing in the non-glycerinated portion of the water, as in the case of water which had never been doctored.

There is one sure way to prevent freezing; drain off the water nightly or whenever the car is to be given a rest. It is slight trouble. The cock can be opened, and by the time the car is washed off and stripped of its lamps and other things (which in a well ordered motor house are always removed for brushing and cleansing), the whole circulation is drained dry. But be sure it is absolutely dry.

Rattling Batteries.

See that the storage batteries are always held tightly in their box, and that all connections are tight. Rubber sheeting is a good material for packing the batteries and deadens vibration to a large extent.

THE REPAIR SHOP

BEARING FRICTION.

Different Kinds and Quantities of Lubricants Required.

BY SYDNEY F. WALKER, M. E.

Lubrication is one of the most important matters in connection with the motor vehicle. It would hardly be too much to say, that it is the most important. If lubrication is not properly attended to, if every pair of metal surfaces moving over each other, are not continuously supplied with a proper lubricant, the results may be very serious. Whenever a car comes in, complaining of loss of power, or that any part of the apparatus does not work properly, lubrication should at once be suspected. It is one of the most likely things to upset the working of a motor car, and the motor repairer or car owner will be wise to make a careful examination of every part, where lubrication ought to be carried out, and of the lubricating

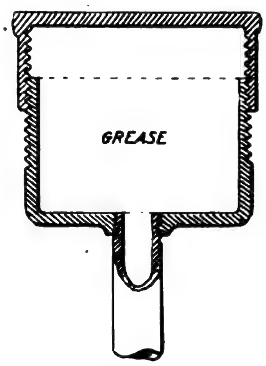


FIG. 1.

apparatus itself first, unless there are clear indications that the fault is not due to want of lubrication.

In every motor car, there is a very large number of places, where metal surfaces are necessarily sliding on each other, so long as the engine and the car are running, and if they are to keep running, it is an absolute necessity that there should be a fine film of lubricant, always present between the two surfaces. In order that this film shall always be present, some arrangement must be made by which a supply of the lubricant is always ready to pass into the fine capillary space between the two rubbing surfaces, and the arrangement must be such that the rubbing surfaces draw the lubricant in between them, exactly in proportion to the friction which takes place.

It should be noted also, that there are two distinct classes of lubrication to be provided for in the gasoline motor engine, the lubrication of the inside of the cylinder itself, the crank chamber, etc., and the lubrication of the numerous axles in their bearings, gear wheels, etc. The broad distinction between these two classes of lubrication, lies in the temperature to which the lubricant, in the two cases, is exposed. In the lubrication of the cylinder, the lubricant has to stand a very high temperature, while the lubricant employed for the axles, gear wheels, etc., should not be exposed to high temperatures. If the other parts of the apparatus, outside of the engine, become appreciably hot, it is a sign of bad lubrication, and it may also possibly be a sign that the cooling appartus is not working properly. The two classes of work, with high and low temperatures, require, as will easily be understood, quite different kinds of lubricant. The lubricant for the inside of the cylinder might answer for axles, etc., but it would be very wasteful, and would require special arrangements for maintaining a continuous supply. It would be unnecessarily expensive also, if used for those purposes. The lubrication of the axles, etc., can be carried out by a very much inferior and less expensive kind of lubricant than is necessary for the inside of the engine. The main thing to be insured with the lubrication of axles, gear wheels, etc., is that the lubricant shall be constantly in evidence, constantly present between the rubbing surfaces, and a supply constantly ready to pass in between the surfaces, as that which is already there is used up.

With properly designed axles and bearings, and providing that dust and grit is kept out of them, the quantity of lubricant used is very small, but it is of the utmost importance that a supply should always be there, in case of grit getting in and in case of accidents, such as are only too common with motor cars, slight strain upon axles or bearings leading to increased pressure between the surfaces, and an increased need for lubrication. Again the lubricant required for different forms of bearings varies. The lubricant for the ordinary sleeve bearing differs from that required for roller bearings, and again from that required with ball bearings. It is a peculiar feature in connection with the development of roller and ball bearings that while their use is of great

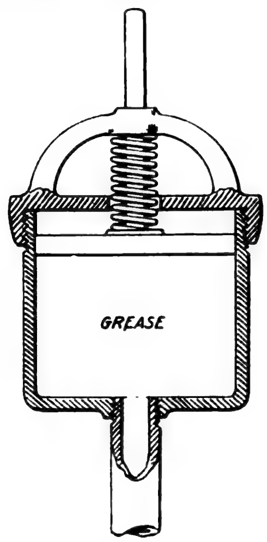


FIG. 2.

advantage in reducing the friction, this is only obtained on condition that a proper lubricant is provided, and a higher class lubricant than would answer with the ordinary sleeve bearing. The reason is, in the sleeve bearing the axle is in contact with the bearing for a large portion of its surface, while in the roller bearing it is in contact with a certain number of surfaces, together only a fraction of the contact surface in the sleeve bearing, and with the ball bearing it is in contact with points, making together only a fraction of the roller bearing surfaces.

There is not space in the present article to discuss the different forms of lubricant for roller and ball bearings, as distinguished from that required for sleeve bearings.

The writer will hope to do so in another article in a later number of THE AUTOMOBILE DEALER AND REPAIRER, and he also hopes to deal with the problem of the proper lubricant for the cylinder. Meanwhile, with sleeve bearings, it may be pointed out that the conditions mentioned above are very fairly met by the cup lubricator, containing a solid grease, and having either a screwed cap at the top, or a cap with a plunger having a spring behind it. The cup has a small pipe, as shown in Figs. 1 and 2, leading to the bearing. The small pipe is full of the lubricant, and the axle rubs against the end of the little cylinder of lubricant in the pipe as it passes, taking up exactly as much as it wants. If from any cause there is additional friction between the axle and its bearing, heat appears, and the lubricant melts, and runs more quickly into the bearing. The operation is insured by the action of either the screwed cap or the spring pressed plunger. With the screwed cap a turn is given to the cap from time to time, as required, to keep a pressure upon the body of the lubricant inside the cup, and this is sufficient to keep the lubricant in contact with the axle, under ordinary conditions. It is complained, however, that the screw down is sometimes forgotten, and to meet that, the automatic plunger held down by the spring, whose tension can be regulated, has been provided. For ordinary sleeve bearings, this apparatus should answer very well.

PUTTING ON A MAGNETO.

How to Make the Connections for Two Cylinders.

From James F. Hobart, Michigan.—Mr. Virgil Aldrich, Nebraska, asks for a diagram showing the wiring for two cylinders connected to a single magneto. Mr. Aldrich also asks what causes current to jump the gap on the spark plugs by using a magneto?

There are several ways of connecting up one or more cylinders, and it makes little difference whether the source of electricity is a magneto, a dynamo or a battery.

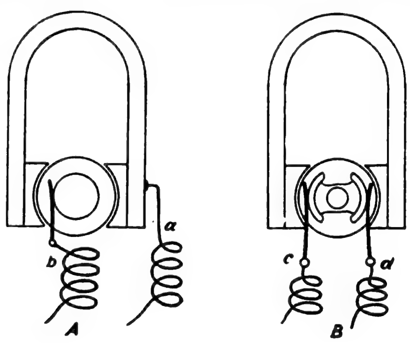


FIG. 1.

In each instance, the wiring and other connections are about the same. All that is required is to send across the spark plug gap, at exactly the proper instant, current enough to ignite the charge of gas which happens to be in the cylinder.

If the voltage be sufficeintly high, and the resistance of the circuit, including the air gap, suffcently low, then nothing further is required to make the current jump the gap at the plug, thereby producing the spark which ignites the charge in the cylinder. There are various kinds of magnetos—or rather there are various kinds and styles of connections for that form of generator. The construction of the magneto itself, however, is about the same, no matter what make is at hand. The difference becomes apparent when the connections are made which are to take away the generated current. In the ordinary magneto, one wire may be grounded on the core of the armature. The other end of the armature wire is led to a ring on the armature shaft and a brush on this ring or collar carries the current away to the line wire as fast as the current is generated.

This form of connection is shown at diagram A, Fig. 1, the wire a being grounded upon the magnet of the magneto, while wire b is brought out to a ring on the armature shaft and a little brush makes the connection with wire b. In sketch B, both ends of the armature wire are brought out to a two-part brush, and connected as shown at c and d, respectively. The difference in effect of the two kinds of connections illustrated by sketches A and B are that in A an alternating current is delivered, while in sketch B a direct or continuous current is sent out from the armature wire.

For certain reasons, a direct current is more desirable for jump spark ignition, though if properly constructed

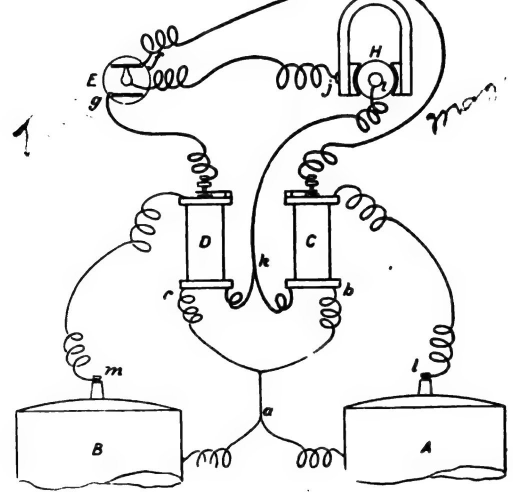


FIG. 2.

spark plugs are used, good results can be obtained with the alternating current. With the ordinary plug, where it is desirable to keep the igniting current passing always from the plug to the cylinder, then a commutator is necessary as shown by sketch B, Fig. 1. Were the single ring to be used as shown by sketch A, then the spark would sometimes pass from the plug to the cylinder, and at the next half turn of the magneto armature, the spark would pass from the cylinder to the spark plug—quite an unconventional performance. The two part commutator prevents this happening as the commutator "commutes" an alternating into a direct current.

Fig. 2 shows how a magneto may be connected to ignite two cylinders; various other forms of wiring may be used, as the method shown is practically the one employed with the battery or with the magneto. The two cylinders are shown at A and B, Fig. 2, the wires being connected to the plugs at l and m, in the usual manner, while the circuit is grounded upon both cylinders by a common return wire at a. This wire is the secondary from both coils as shown at b and c, attached to coils C and D respectively. The writer prefers to use two coils instead of one, as by so doing it is not necessary to pass the high-tension secondary current through the timer—something which would have to be done were a single coil used instead of the two shown.

The primary wires are brought to the timer-brushes at f and g, in the usual manner, the timer E being of any commercial form. The magneto wires i and j are then connected as shown, one to timer E, the other to the common coil-connection at k. In the engraving, a magneto with a single brush ring is shown, one wire being connected by brush to armature H, while the other wire is grounded at j. Should it be desirable to use a continu-

ous, or direct current magneto, then the wire will be removed from its ground at j, and attached by means of another brush, to the two-part commutator which must be placed on the armature shaft.

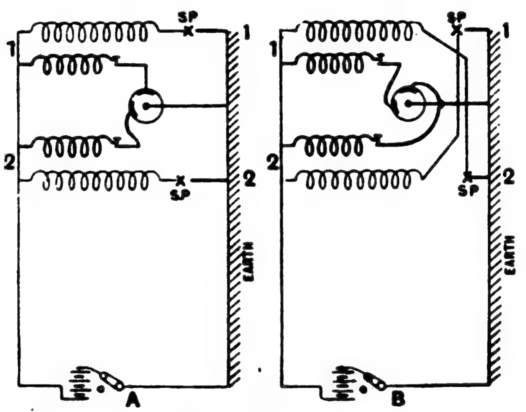
Personally, the writer is in favor of the latter arrangement and he would not use the alternating current magneto for a car of his own. It is preferable to use a coil with the magneto, for otherwise, an enormous amount of wire is required on the armature to generate potential (voltage) enough to cause the current to jump the gap in the plug. An ordinary telephone magneto will deliver current at about 10,000 volts, but this is not enough to jump the spark plug gap, therefore it is desirable to use larger wire on the magneto armature and obtain more current. Then work up all the voltage necessary by means of the coils, and there you are.

FINDING THE TROUBLE.

A Process of Elimination Is Often the Best Method.

The following ignition problem has been troubling motor mechanics and engineers in England, the car being an English pattern. Judging by the effect produced when the two vibrators are alternately held down, one cylinder works very much better than the other. No. 1 cylinder, we will say, is enough to keep the engine running, but No. 2 fails, the engine gradually coming to rest. Does this arise from a defect in the cylinders, the vibrator coil or the commutator? Further, when the connections are interchanged, putting No. 1 coil on No. 2 cylinder, this combination behaved badly, the No. 2 coil on No. 1 cylinder being all right.

From this it might have argued that No. 2 cylinder was at fault, for No. 1 coil which supplied No. 2 cylinder in the first case behaved satisfactorily. Further, No. 2 coil cannot be faulty, for when driving No. 1 cylinder it was all right; and further still, another coil was borrowed and substituted without any difference.



In the arrangement A the cylinder fired by No. 1 coil worked well; in B the cylinder fired by No. 2 coil worked well.

In this juggle the commutator connections have to be changed with the primary. In other words, No. 1 section on the commutator always serves No. 1 cylinder, this apparently being necessary to secure the correct sequence of firing. It was thought, therefore, that it might be the commutator section No. 2 that was wrong. But to eliminate that as far as possible, the commutator was sent to the makers and relined, but with no appreciable improvement, showing this procedure to have been unnecessary. The wires and connections had been all carefully examined and found all right, also the sparking plugs; all four valves have been ground in and the compression was perfect. The only explanation suggested was that one cylinder is in a more favorable position for reception of gas or in relation to flywheel effect.

The man who stated the foregoing problem seems to have been more anxious to make a problem out of it than to find out the trouble. Proper and full investigation would have found the trouble easily. In a case of this kind the only course to pursue is to eliminate one possible source of trouble after another until the fault is found, although in the so-called problem this was followed up but part way. There appear to be at least three possible solutions of the problem. It may not be an electrical trouble at all; it may be the spark coil of No. 2 cylinder that is at fault, or it may be, notwithstanding the fact that the commuator was relined, the commutator that was at fault. The present writer would suggest that No. 2 cylinder should be isolated, or, at any rate, arrangements could be made to ignite the charge by an independent ignition outfit, using the present spark plug. If the charge does not ignite, it still may be the spark plug, or it may be some other trouble not electrical. Replace the spark plug by one that is known to be right, say the one from No. 1 cylinder, and again employ the independent ignition outfit, that is also known to be working properly, and again try to ignite the charge. If ignition still fails, it will be clear that the fault is not electrical, and further examination of valves, etc., must be undertaken.

If on replacing the spark plug by one that is known to be right, and firing with an independent coil, etc., ignition takes place, though it has not taken place before, it will be pretty clear that the fault was in the sparking plug.

If the use of an independent ignition coil, eliminating the commutator together, enables the charge to be fired with the present sparking plug it will be pretty clear that the commutator is at fault. The commutator is a weak part of the apparatus, the one that is likely to cause the greatest amount of trouble and the one that should always be suspected, and it by no means follows that because it has recently been at the works and been relined or done up that it may not still be at fault. A commutator may test perfectly when the engine is not running, and develop trouble immediately the engine begins to run.

If the trouble has been hunted down to the commutator on the above lines the next step, if it can be arranged, is to change over the commutator segments. Probably that can be done temporarily if No. 1 cylinder is thrown out of action, and if all that is required is to secure ignition.

The one thing necessary in all these cases is to hunt the trouble down from step to step, gradually eliminating one thing after another and arriving at a solution by the process of elimination.

Clincher Tire Attachment.

Improper attachment of a clincher tire to the rim is certain to result in trouble before many miles are covered, as the inner tube is pretty sure to be caught between the shoe and the rim, or between the shoe and a retaining stud, the result of which is the well-known "pinching." The portion of the tube near that which is caught is subjected to increased strains, while in a stretched condition, and the tube will soon burst or tear at the point of pinching. If the outer shoe is not caught properly between the rim and stud, great damage to the shoe may result, and in the case of many tires, the inner tube may blow out through the space between the shoe and the rim near the improperly set stud.

FITTING TIRE TUBES.

Another Way to Do It Without Nipping Them.

Here is a tip which if you use ordinary care in following will put an end to your difficulty of fitting air tubes without "nipping" them. When you have heard the tip you will perhaps say, "Why, this is exactly the reverse of what one is usually told to do in this matter;" and this is so. The great essential for success is, however, that you must do exactly the reverse—no half measures.

You have always been told to slightly inflate the air tube which you may be fitting, after you have placed it in position inside the outer cover and before attempting to replace the latter. Well, do not allow any air at all to be in the tube until the latter is in position on the wheel and the outer cover is in place, nor, in fact, until the security bolts have been tightened up and everything ready for inflation proper.

The point to emphasize is to have no air in the tube at all. Do not just hurriedly squeeze the latter and get most of the air out, but take the valve to pieces, before putting it in the rim, and roll the tube up carefully. Com-

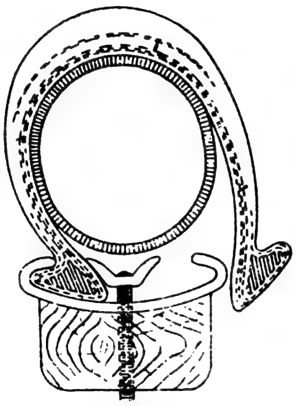


Fig. 1.

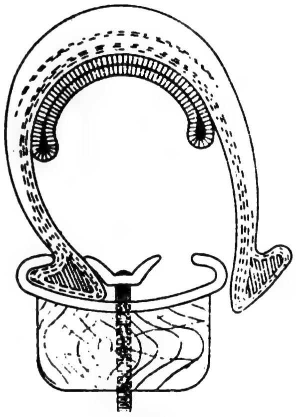


Fig. 2.

mence at a point exactly opposite the valve in the circumference of the tube, and with the latter "inside out," as it were, that is, with the valve pointing outwards. By this means, it is easier to get all the air out.

Now, before unrolling the tube, refit the valve together and screw the small dust cap tightly in place, for if this cap is not fitted air will re-enter by way of the valve, because of the natural tendency of the tube to resume a shape other than perfectly flat. Care must be taken that the tube is not twisted at all, either in the process of rolling or in the subsequent fitting into position. If all is correct in the latter respect, just replace the cover in the ordinary way, but do not partially inflate the tube as usual, nor allow any air to enter it until the job is quite finished.

If you will examine the sketches—which represent the position the tube takes up inside the cover when the latter is being fitted, Fig. 1, by the usual method of partially inflating and, Fig. 2, by the way suggested—you will see the reason why it is almost impossible to "nip" a tube when the latter method is adopted.

It is also a quicker method than the other, for on numerous occasions tubes have been changed by the roadside in less than seven minutes, including inflation, and that is not bad for an amateur whose only practice is in handling the tires of his own car. Always keep spare tubes rolled up with all the air out and valve cap screwed on, so that no time need be wasted on the road.

Take a tube out at home when you have a little spare time and try the plan.

CHAIN WEAR AND REPAIR.

Some Expedients and Forms for Cases of Emergency.

There ought to be in every motor vehicle repair shop extra pieces of chains of different sizes. There should be a box of various kinds of links. There is no harm

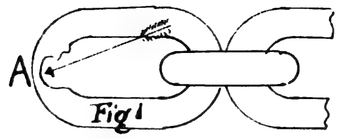


Fig 1

done in having an assortment of patented clasps and other forms of self-gripping, self-closing and self-acting emergency links, for these links are useful when your patron is in a hurry. He can come back later and get a new chain or have a firmer and more permanent link rivetted in or welded on. There should be light links for the smaller chains and some heavy ones for the larger chains. There ought to be a collection of soft

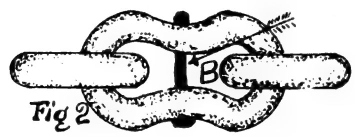


Fig 2

metal links for special purpose, to clip on quickly, and some bronze metal links for places where the extreme of strength is needed. Perhaps the chain is only a part of the steering gear. It may be in the clutching combination. There may be chains for braking and chains on various patented and special devices. There are chains carried on some machines to haul broken down autos and for the adverse purpose of being hauled in the event of

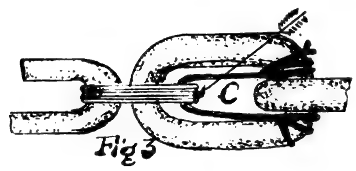


Fig 3

a breakdown. There are chains for swinging articles below and chains for securing packages for tourists on the rear platform. In fact, there are enough chains of various kinds in use every day on automobiles to warrant the repairmen in having the proper equipment for the care and maintainence of the same.

We hear much about the broken chain link. As a rule, the link has been worn down to considerable degree before it breaks. If a chain is glanced over, the defects do

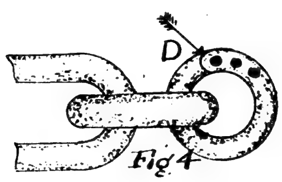
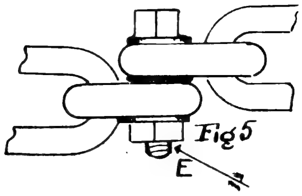


Fig 4

not show very prominently. But if the chain links are examined inside at the bearings, the links will be found worn as at A, Fig. 1, unless the chain is new and has been used but a short while. After a short time of daily usage, unless the chain is made of exceptionally hard metal, the wearing and scoring begins. This wear causes the chain to stretch. In time it may be necessary to remove a link or more to retighten the chain and keep it from running off the sprockets. The wear is excessive in neglected chains. If the links are allowed to become dry and gummed, wearing of the bearings begins immediately.

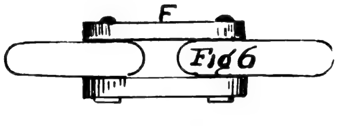
Usually the chain is not taken to the shop until one of the links breaks open. Then a new link is installed, or, better still, if the other links are worn, a new chain is put on. To weld a link for a chain is not hard work, but is not understood by many, hence the use of the numerous quick-fitting emergency links which one finds in shops



and should be carried by automobilists. To weld the link, the rod of metal is cut a little longer than needed, and the ends tapered when hot on the anvil. The link is bent over on a form and shaped. Then the broken ends of the chain are joined and the tapering ends of the link are heated and welded.

Sometimes weak links are sprung, as in Fig. 2, in which case, the weakness can be overcome by simply boring a hole through the sides and inserting a wire pin, B. The pin is headed up in the bore.

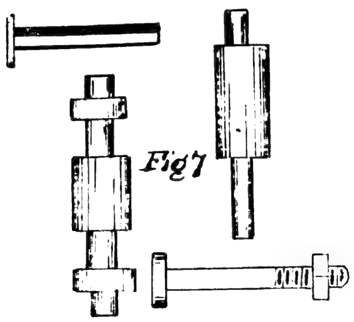
Fig. 3 is given to illustrate a piece of chain emergency work done on the road not long since. The condition



shows how the patching appeared when the car was taken to the shop. The chain had broken on the sprocket gear. The touring party secured some wire from a farmhouse and proceeded to bind up the joint, as shown at C. Quite an ingenious combination is exhiibted. The party managed to make slow time to the nearest shop where a ring was put in because that was the best that could be done at the time.

Fig. 4 shows this ring. The ring was installed by rivetting the bevelled ends, as at D.

If the chain does not have to pass over sprockets, as in the case of the sprocket wheel, the links may be quite queer and still run. Fig. 5 shows another combination used by a party in making a quick joint for a broken chain. This consisted simply in inserting a bolt through



the next two links, securing the bolt with a nut. This made the chain run wabbly. A better way for joining up on this plan is shown in Fig. 6, for the chain is then equally balanced for running. The links are brought up to place and two side pieces of metal are pinned on, as at F.

Among the assortment of pins and links which it is found advisable to carry on hand in repair shops are the specimens shown in Fig. 7. These are ready for inserting in almost any desired way. The ends may be headed up, or a nut can be used on the threaded pin.

TROUBLE DEPARTMENT.

Questions answered by the Y. M. C. A. Automobile School, 322 West 57th St., New York.

This department is intended to be a "trouble clearing house," and it will be esteemed a favor if our readers will add information to it from their own experience or knowledge.

Care of Storage Batteries.

Question.—Will you kindly inform me through your paper the best way to take care of storage battery during the winter when not in use?

Answer.—The most simple way, and therefore perhaps the best way to take care of a storage battery during the winter months, is to first of all have it fully charged, then cover all of the terminals and screws with vaseline and keep the battery in a moderate temperature. Extreme cold, however, will not do the battery any great injury. This method would necessitate recharging the battery every 4 to 6 weeks, as the plates sulphate slowly even when the battery is not in use.

Another method is to fully charge the battery, then draw off the electrolyte, after which fill the battery with distilled water and discharge fully through the induction coil on the automobile. Then take the plates out of the jar, wash them thoroughly and allow them to dry. They should then be packed in dry saw dust. The jar should be washed out, as there is likely to be considerable sediment in the bottom of it. The plate separators should be allowed to dry and then packed in the jar. The electrolyte may be saved if kept in a glass or porcelain bottle, but should not be allowed to come in contact with metal at any time.

Size of Wheels.

From I. N. Kibler, Pennsylvania.—I take great interest in your trouble department. In it I find a great many valuable instructions.

I have a 12 horse-power light touring car, which weighs 1,850 pounds without load, which is too much weight for my engine. We have a very hilly country where I live and at times I have to unload at steep hills. My car has 30-inch wheels. I was thinking of having them cut down to 28-inch. How much more power would I get? I have plenty of road clearance and more speed than I need, and would there be too much weight for a 3x28 tire. Would you please give me your knowledge on making this change?

Answer.—In changing from a 30-inch to a 28-inch wheel, you will obtain a reduction in speed of about 7 per cent. and a corresponding increase in hill-climbing power. I doubt if this would be sufficient for your needs. No tire manufacturer would guarantee a 3-inch tire to stand up under the weight of your car and load. If your car is chain driven it would be a very simple matter, and you could obtain a much greater gain in hill-climbing power by exchanging the driving sprocket for a smaller size.

Stiff Transmissions and Hot Engines.

Question.—I want to ask a few questions. I have a 16-20 horse-power Reo Touring Car. The transmission runs stiff. What is the best way to clean it? I use grease in it. Which is the best oil or grease? Also, my cylinders get pretty warm sometimes on short runs.

Answer.—The stiffness in your transmission probably comes from the fact that you use grease in it. In that type of transmission there are many small parts to be lubricated that the grease cannot reach. Wash the gear

out thoroughly with gasoline, using a squirt gun or syringe, and put in plenty of heavy oil. This should remove the difficulty.

There are many reasons for an engine overheating, and it is difficult to decide from the information you gave us just what the trouble is in your case. A few causes of overheating are: Lack of lubrication, defective water circulation, running with a retarded spark, and a carbon deposit in the cylinders.

His Car Starts Hard.

Question.—Will you please tell me what is the cause of my car being so hard to start? Sometimes it is almost impossible to start the engine. A few days ago I cranked it about fifty times and could not start, so had to give it up. I have a Ford Runabout.

Answer.—We presume that your trouble is caused by the cold weather. A great many engines are hard to start when the weather is cold, because of the difficulty in vaporizing the gasoline. This can be overcome by placing your hand over the air inlet of the carburetor, thus cutting off most of the air supply, or by injecting a small quantity of gasoline into the cylinders which will cause a sufficient number of explosions to start the carburetor working.

We assume that the ignition system and valves are in proper working order.

Power and the Exhaust Valve.

Question.—I have a 5 horse-power Olds Runabout and would like to know if I rebore the exhaust port and put in a larger valve if it will give me more power, and would it pay.

I would say to W. N. H. of Wisconsin to use good coach varnish instead of linseed oil, as I have been a painter for over ten years and never yet saw a nice job of work as he speaks with oil; it gathers dust and is most always sticky.

Answer.—If the engine is in a normal condition you would receive very little benefit from enlarging the exhaust valve. If you are quite sure that the gas does not exhaust freely enough, it may be that the valve does not open sufficiently. It should open one-quarter of the diameter of the exhaust port. If the cam is worn so the valve does not remain open for a sufficient length of time, this would cause back pressure on the exhaust stroke and the cam should be replaced. The valve should start to open when the crank is about 50 degrees before bottom center and should remain open until the crank is about 10 degrees past top center.

Cork and Grease.

Question.—Kindly inform me through your good paper if cork and grease in the front gear case for a Pope Hartford 1907 car is O. K. to stop gears from rattling.

What kind of oil to use for wood work to store car for winter in cold garage.

Is there anything to put on the cravanet top to keep it from cracking during the winter?

Answer.—A mixture of grease and ground cork put in the 2 to 1 gear case will reduce the noise of the gears but is likely to hinder the lubrication of the cam shaft bearing. If the gears are worn enough to rattle it would be advisable to replace them with new ones.

It is not necessary to use any oil on the wood work of the car, as the cold will not affect the varnish. Neither is it a good plan to put anything on the top.

Cylinder Heat Waste.

From O. H. Hampton, Indiana.—Mr. Hobart's article on this matter says, "The entire water jacket business is a drag upon the engine, and is a source of waste from start to finish." Every word of this is true, but he further says, "We cannot dispense with the water jacket, for we will quickly get into trouble if we try it, owing to the intense heat of the explosion, some 1,500 to 3,000 degrees the oil would be decomposed, and without lubrication, the cylinder would soon be cut to pieces."

When the writer was looking into the various makes of gasoline autos, he heard so much about air cooled engines being no good, for the very reasons mentioned by Mr. Hobart, that he got very much out of the notion of entertaining any thought of any but water cooled engines, but one manufacturer made such a favorable proposition that his air cooled engine was all that stood in the way of closing with him. He offered to make any tests that the writer desired, and the writer asked that the machine be run over average country roads for four hours without a stop at an average speed of 15 miles per hour, and if there was no sign of overheating, his proposition for a trade would be favorably considered. There was not any overheating at the end of the test.

The thermometer reached 90 degrees that day and there was no wind. A stop of five minutes was made to fill up with fuel and oil, and the vehicle was then driven 70 miles at the same average speed, with but three stops of five minutes each. Since then the machine has many times been driven for hours at a time with the engines supplied with all the fuel they could use, and there has never been any overheating. The cylinders are as smooth now as they ever were; in fact, they are slightly smoother than when they left the boring machine. Oil drawn from the crank case after it gets cold looks as it did before it was put in, except it shows a little carbon suspended in it. These cylinders of course get hotter, much hotter than water cooled ones, but not hot enough to injure anything, and as gases are expansive in proportion to their temperature, they get more power out of a given quantity of fuel than a water cooled cylinder gets.

There is a very noticeable increase of power after the cylinder gets good and hot; at least 50 per cent. more.

There are air cooled engines that do get too hot and have been ruined by the heat, but if they were properly built they lacked one or more of the three things that an air cooled engine must have; the proper kind of oil, enough radiating surface, and sufficient fanning. The manufacturer of the above mentioned engines declines to guarantee his engines if used with any oil except that specified by him.

The writer is unable to see how any increase of power is to be gained by injecting water into the hot exploded gases in a cylinder, as the heat which converts the water into steam is taken from the hot gases, thereby decreasing their expansive power. Theoretically it looks like it would just be a matter of more gas at a lower temperature.

Oil for the Body.

From Harry F. Clifton, Indiana.—I see in THE AUTOMOBILE DEALER AND REPAIRER where someone asks about putting linseed oil on the body of his automobile, making it look like new. I will say it is good, but I have found something that beats it out of sight to my notion, that is an oil called 3 in 1. It is also good for the upholstering. It is dry in a minute after applied, and a little goes a long way, a tablespoonful will almost polish a whole car. It is the greatest lubricating oil ever invented for small machines (not for cylinders, as it is too expensive); the best

thing to use on your commutator; rub on your brass after polishing and it will hold its lustre longer. I have used it over a year, and I often find something new it is good for, in fact, it is the best thing for anything that needs polishing. As a lubricator squirt a little in your cylinders and they will not carbonize, try it on your sewing machine, you will be surprised to see the difference in it and the oil you are using. The Three-in-One-Oil Co. will be pleased to send any one a sample for the asking, but don't fool with a sample—buy a bottle, they give good prices to dealers.

Bodies Loose on the Chassis.

From B. W. M., New Jersey.—I must tell you of a peculiar experience which fell to my lot recently. I drove, entirely alone in the car, and soon after starting and still running over some of rough roads I noticed a noise each time the car passed over any more than ordinary unevenness. The noise referred to gave me the impression that something heavy, such as the lifting jack, was jolting about in the tool space at the back. I stopped with the idea of making things secure, but, to my surprise, all the heavy tools and impedimenta were quite firmly fitted in their correct places. I started off again, only to notice that the jolting noise got worse as time went on. I thought that the chassis was bumping on the axle by reason of a broken or strained spring, that the differential casing was hitting the floor, or something of that sort, but another stop and a further examination showed the impossibility of any of such causing the trouble. It got so bad at last that I could feel the jolt of whatever was loose or defective right through the car. Soon a large car passed me going in the same direction, and as it went by, one of the occupants called to me, "Look at your body!" I stopped, went to the back of the car, and looked round carefully, but could see nothing loose, broken, or defective.

However, I went on once more, and at the next town I saw the car which had passed me stopped in front of the hotel, so I went inside and asked the man what he meant when he called out, "Look at your body." "Why," he said, "it's loose on the chassis; just before we passed you we distinctly saw it lift away from the frame two or three inches when you went over a bump in the road."

And there was the explanation of the bumping and jolting I had heard and felt.

The body should have been secured to the pressed steel frame by four bolts, but I found that both of the rear pair were missing, and that the body was only being held in position by two at the front end, and they were loose. This experience brings to light another detail which should receive periodical examination, for the thought of what might happen at a corner, taken rather fast, if one of the front bolts had fallen out as well will make me rather careful of this point in future. Why, the body might leave the chassis completely, and such an experience would be more novel than pleasant.

A Worn Clutch.

From James Inness, Ohio.—I came across what I thought was rather a good tip the other day. When returning to town I saw a large industrial motor vehicle standing at the side of the road and the driver apparently working at the clutch. I stopped and asked if he wanted anything, and, although receiving a reply in the negative, I remained for a few minutes to see what the trouble was. It appeared that the leather of the clutch was worn a good deal—so much so that the metal portion of the cone was making contact with the arms of the flywheel, and consequently slipping badly.

The driver was attempting to improve matters temporarily by a method he assured me he had used before with success, and I can quite imagine he spoke truthfully. He had drawn the clutch back and removed the screws securing the leather (two or three at a time), and was fitting sections of several thicknesses of brown paper between the leather and the metal, so enlarging the cone, and securing the same effect as fitting thicker leather.

A Steam Car Champion.

From W. B. Dalrymple, Vermont.—I notice in your December number an article from C. G. Glover, Wisconsin, about steam cars. He does not mention the make of his car or cars, but he makes such rash statements that I wish to give you my experience with a steamer this year.

In May my mother began thinking about buying a small car. After looking around some, we thought we liked the actions of the Stanley steamer and ordered a runabout with folding seat, rated at ten horsepower, price $850. We had never ridden in a steamer and I knew nothing at all about steam power. The car was driven from Newton, Mass., to Burlington, Vt., 21 miles from here. On June 10, 1908, I went to Burlington and the agent and I started for Vergennes. The agent drove until six miles out from Vergennes and then I took hold and drove in and took the agent to the station and have been driving ever since without help excepting a few pointers given me by people with experience. I have driven in the neighborhood of 3,000 miles and nine times out of ten I have had three or four passengers. Total repair bill, $1.75 for one superheater, $5.30 for one inner tube. The two forward tires have never been flat. Gasoline consumption not known exactly, but I have figured on getting twelve miles per gallon with four people and have always had lots left. Cylinder oil, ten gallons.

I am perfectly satisfied with the machine and as far as hill-climbing is concerned he knows not of what he talks. Speed also they have to burn. His pilot light would not bother him if he would clean the vaporizers once or twice a season.

I would like to meet him in a gasoline car of the same price or double and at anywhere near the same horsepower and with the same number of passengers on some of our Vermont hills. Send him along and we will show him whether we can make steam to the top or not.

Everyone to his own liking, but a steamer for mine unless you can put from $2,500 to $5,000 into it.

Favors Steam Cars.

From M. L. Collier, Atlanta, Georgia.—I have just been reading THE AUTOMOBILE DEALER AND REPAIRER, in which I notice an article from G. C. Glover, New Richmond, Wis., in which he handles steam automobiles rather roughly.

I drove a Gasoline car one year and I ran that car between 15 and 16 miles to the gallon of gasoline oil and kept the car in the very pink of condition all the time, doing all the work myself.

For the last six months I have been driving a thirty horse-power White Steamer of the latest design. This is a runabout. It weighs 2,900 pounds. In six months service, or about 6,000 miles, this car has cost me 50 cents. This item was for packing the valve stem stuffing boxes. I run from 8 to 9 miles to the gallon of gasoline oil.

Now I am not prepared to say what kind of steamer this Glover family was using, therefore I am not in a position to criticize his article as severely as in my judgment it ought to be criticized. When he makes the statement that he runs from 1,200 to 1,500 miles to the gallon with an Oldsmobile car or anybody else's car, I say that

is a mistake of the printer and should be 12 to 15 miles to the gallon. In six months' time I have driven my car over all kinds of roads, and it is a hilly country around Atlanta, and there is not one single feature of this car that has ever given away. As far as the White Steamer is concerned it needs no praise at my hands; the car stands on its own merits the world over, and I would not to-day exchange my car for any gasoline car that I ever saw, or ever heard of, or ever expect to see, or ever expect to hear of.

It will be proper for me to add that the White Steamer people do not owe me one penny, or do I owe them one. I paid for my car spot cash and therefore am under no obligations to them whatever for anything. These are actual facts as demonstrated in six months' handling of the thirty horse-power, model K, White Steamer.

(Note by the Editor.—It is proper to add that Mr. Collier is a superior mechanic and this should give added weight to his experience and his opinion.)

PAINTING AND VARNISHING.

How to Touch Up and Varnish the Car and Match Color.

BY M. E. HILLICK.

Such jobs are not always satisfactory from the standpoint of the painter, but they are a necessity, nevertheless. As long as there are men to buy automobiles we may expect this class of work to reach the paint shop. The difficulty of matching the color in touching up constitutes the painter's chief source of trouble, as we know from experience. However, all things considered, there are equal, if not greater, profits to be derived from the touch up and varnish jobs, than from other classes.

The first move, after getting the automobile located in a desirable position and elevated upon wooden horses to a height admitting easy work in cleaning up the running parts, is to saturate the grease and dirt smeared parts with turpentine, floating the fluid on with an old soft camel's hair brush. Gasoline and petroleum mediums are sometimes used for this work, but they are far less effective than turpentine, and at the present quotations the latter is not greatly more expensive per gallon than the former.

As a rule, if the parts are badly clogged up with grease and dirt, it is best to wet them with turpentine, and let stand over night to soften up. In the morning give a fresh application of turpentine and then with strips of coarse burlap proceed to wipe up the parts. A sharp putty knife with a good cutting edge will help to dislodge the accumulations if unusually thick and hard set.

This cleaning of the running parts is downright hard work—the limit, in fact, some one has said, but it can be made to pay, and does pay, if pushed with vigor. As soon as the grease and dirt cleaning has been completed the body should be rubbed over with pulverized pumice stone and water, using a perforated felt rubbing pad, and rubbing just enough to slick off the dirt knots and condition the surface for varnishing.

Avoid using much of the pumice stone flour, and thus save time washing up, while getting equally good results. Keep the water out of the inside of the body. In fact, be as tidy with the work as possible. Then give the surface a thorough inspection in order to get a clear idea of the amount of touching up necessary, and also to determine the real status of the color, how badly faded, etc. Varnish a small patch of the surface as a means of coaxing into the foreground the real color. Then mix your match color with enough varnish to prevent it from drying "flat" or "dead." Give it a semi-lustre to forestall the absorption of light, thus throwing the match color off shade. Match up to the color shown under the varnished patch. Note the various proportions of colors used in striking the proper shade, so the same shade may be made the second or third time, if necessary. In touching up use the color sparingly. Touch the actual blemish or disfigurements only, and blend the edge of the color patch down so that no heavy edge or perceptible break of color will show. Insufficient touching, as a rule, will be less conspicuous than a surface "overdone" with color smears, except when the match between the old and the new is close enough to render detection improbable, which, it must be confessed, is seldom the case.

Having completed the touching up of the body permit the surface to stand over night before varnishing. In case of the running parts being badly smudged with greasy stains, whip some ordinary shellac into a thin glaze with denatured alcohol, and lay on a very light film of the shellac over the parts under suspicion. This will serve to bridle the grease and prevent it from unseating the color or the varnish. Parts upon which, in cleaning the grease, the paint has become smeared and discolored beyond means of repair with a simple touching up treatment, had best be coated in solidly with the match color, and, if necessary, striped anew. This renewal in case of running parts in bad condition will be found cheaper, as a rule, than attempting to match them up, and the appearance will be several fold better.

The surface of the body and running parts having been carefully touched, it remains to next flow the work with a reliable finishing varnish of good body, and with a capacity for standing out, at one coat, rich and full and fine of lustre. The interior of the body, where an exposed surface is presented, having been touched with color or coated in solidly, should first be varnished, a couple of brushes specially assigned to this work being used. Next, with a set of brushes used only for finishing outside body surface proceed to flow the body, coating in solidly a panel at a time, however large it may be.

A one inch soft badger hair brush is an excellent tool with which to run the outside edges of the panels, and for catching up a stray dislocation of the varnish. Then a 2½ inch, or a 3 inch, or even a 3½ inch elastic bristle brush, as the size of the panels may indicate, will serve as the proper coating in tool. Coat in the largest panels before cross brushing, laying the varnish with horizontal strokes of the brush. Shape the mass up with vertical strokes and lay off with final horizontal brush strokes. The following morning the varnish should be free from dust and quite out of the way of danger. Burnish up all polished metal parts, clean the glass, and send the machine into service looking like new.

They Must Pay Duty.

The customs appraisers in New York have decided that an American can no longer bring in an automobile, nor, in fact, any personal effect, no matter how long he has used them abroad unless he has first become a resident of a foreign country. Undoubtedly this means that he must have been such a resident for at least a year before he attempts to import his machine or other effects. It would seem that the construction of the board will practically put an end to the free importation of automobiles and other household effects by American tourists, for it is not likely that many of them will have acquired a legal residence abroad. This is especially true of Americans who are making a tour of the continent, remaining but a short time in each city or country. Just what will constitute a residence will also be a serious question, and if the Treasury Department follows the decision of the board much trouble may be looked for.

RUNNING AND REPAIRING.

Mr. Hobart Catches a Few Points On the Fly in Northern Michigan.

BY JAMES F. HOBART.

Detroit, Mich., Jan. 5.—The driver of locomotives has been reduced to so near an exact science that the driver of one locomotive has no difficulty in driving another engine; except the mastering of the individual peculiarities of the particular machine he chances to be operating—and the peculiarities of the road to be operated upon or over. The first thing any locomotive driver must do, after becoming acquainted with his machine, is to "learn the road," and this is just as essential to driving motor cars as to running locomotives.

If a man is driving a car between East River Bridge and Coney Island, in New York, his attention is taken up pretty well in dodging teams, and pedestrians and children, and in solving the "cop" question by the very necessary method of: "I saw you first!" It is decidedly embarrassing, to say the least, when skimming along a little on top of the speed limit, with a seemingly cop-clear coast ahead, to pull to one side to pass an obstructing delivery wagon, and find a policeman serenely taking your number from his cozy corner on the front seat of the covered vehicle.

But it is different in northern Michigan. There are no "cops" to aggravate us, no children in the road to tease the driver, and no speed limit to keep tabs on. All that the driver has to do is to watch out that he is not wrecked upon some hidden obstruction in the shape of stump, rut, bank or gravel-hole in the road. I am speaking now of what was recently the lumber district of Michigan, and not of the city driving, where the same circumstances prevail as in New York and other thickly settled places.

One may skim around among the mountains of North Carolina and hold his breath with one hand and his hat with the other as he dodges mountain peaks on one side of the car and 1,500 feet depth of thin air on the other side. You have to take both hands to the hat sometimes, when one's hair threatens to raise your "lid" straight up as some interesting mountain portion of rock or air is deftly avoided by the skilful driver. There are no drivers in either North Carolina or Michigan, this year, except the extra skilled ones. The others have all been killed, or have died from heart failure. In Michigan, the problem in the lumber regions is to follow a winding trail which passes close to stumps and tree-stubs, and which in some places is rutted inches deep in clay or in gravel.

"High speed?" Why, bless you, yes. There's nothing but the highest of high speeds used by Michigan auto-drivers, especially in the woods, and the manner in which they charge directly at a ten-foot pine stub is only equalled by the deftness with which they avoid that stub after the car almost hits it squarely, and then sail away directly toward another and more ragged bit of standing timber.

After five miles of this business, up in Roscommon County, the return journey was commenced with hardly any time to induce one's hair to lay down again. By that time, our courage had gotten its "second wind" and we were able to take notice of the manner in which the wheel-tracks made during the outward journey, fitted into the narrow trails left by much heavy teaming. It was wonderful. The eye of the writer is a good one, but he was utterly unable to detect any deviation of the auto-track from the smooth even curves made by previous vehicle-wheels.

After arrival at the starting point again, the steering wheel was tested and with surprise it was noted that a considerable amount of lost motion existed in the connections between steering wheel and the auto-axle. In chatting about that point with the driver, he remarked that were the mechanism connected rigid, with little or no lost motion, then the car would become so "cranky" that close following of the winding trail would have been an utter impossibility.

"There is always," the driver explained, "a tendency of any car to drive straight ahead without deviating either to the right or to the left, and when once set to follow a curve, it continues to follow that curve until some change is made in the position of the forward wheels." The above being the situation, it is only necessary to pull against the wheel until the height of the curve had been reached. Then the driver took his time—when there was any—in throwing over the steering wheel until it had overhauled all the slack, and further movement of the hand-wheel would cause the car to veer. By this time, and by doing as above noted, the driver was ready for the reverse curve of the narrow trail, which was not long in coming forward to be negotiated in turn. Upon trial, it was found that "stump-dodging" steering was a pretty close approximation of steering a sail boat which carries a strong "weather helm." In fact, it was hold against the curve on one "leg," then reverse and hold against that portion of the curve. And this, repeated at very short intervals, is what constitutes the skilful and seemingly almost intuitive dodging of stumps and stubs in wood-trail auto-speeding. It's exciting—to the novice at least, and it brings some new thrills which are not to be found even in a loop-the-loop arrangement. The best of it is, that in case of accident, nobody is hurt except the occupants of the vehicle which was wrecked—there are no other cars to run into and to damage—only one's own self to take account of in case of accident.

IN TROUBLE.

The writer recently came in contact with a man who was having trouble with one of the four cylinders of his "motor-engine" and all kinds of trouble visited that particular cylinder, while all the others gave no trouble at all. The symptoms exhibited by that cylinder were numerous and various and among them were poor compression, irregular exhaust, cutting of the cylinder wall, and an exhaust sound much lighter than given by the other cylinders.

After considerable consultation, searching and close watching, the trouble was finally located in the water-jacket of that cylinder. It was found that an accumulation of sand and what appeared like scale, had collected in one portion of the water cavity, thereby preventing almost entirely the circulation of water in that jacket. The result was very unequal expansion of that cylinder, one portion being cooled by the water which still found a passage through the jacket, while another portion of the cylinder had no relief whatever from the temperature of explosion.

The stoppage of the water circulation was sufficient cause for all the evil occurrences noted. The unequal expansion of the cylinder permitted much greater friction on the piston and rings in one portion than in another, and the local heated spots volatized the cylinder oil at those places, thereby permitting the unlubricated surfaces to seize each other and cut themselves beyond repair. The cutting and wearing of the cylinder and the piston rings permitted the compression to waste itself quickly through the grooves thus cut in the cylinder and rings, hence the low compression pressure noted.

After the obstruction had been puggled out of the water jacket with a wire and lots of patience and some profanity, the cylinder was reamed and new rings fitted

to the piston, with the result that a complete cure was affected.

Another automobile which came to the notice of the writer, was fitted with a neat tool-box which was so arranged that each tool was in a separate compartment, thus making rattling of tools impossible. Cloth lining in each compartment even prevented the rattle of the tools against the metal sides of the tool affair.

A USEFUL ROPE.

A very unique addition to the tool-box was contained in a separate thin compartment, and consisted of a small coil of flexible wire cable which had been served with a plain hook at either end. This cable was made of what is called "plow-steel" and is much stronger than ordinary steel cable. It was also of the variety known as "hoisting" cable to differentiate it from the common and less strong kind known as "standing" cable, and "guy" wire rope. The "hoisting" variety is much more pliable and will stand rough usage which would ruin either of the other mentioned kinds.

The hooks should be attached to the cable by means of grummets, one for each hook. In the particular cable here described, three-eighths inch, nineteen wire strands were used and the end of the cable after being wrapped around a grummet, was spliced back into itself. This, however, was not absolutely necessary, as the cable could be fastened together either by serving with soft wire, or by clamping the end of the cable with a screwed or bolted clip. In fact, the cable could be simply tied around the grummet, but the splicing in of the ends made much the better job.

When this auto owner desired to get pulled out of trouble, either by a team of horses, or by another auto, or when he desired to pull somebody else out of the mire, it was only the work of a single minute to take the cable out of the box, cast hook-hitches around the axles of each vehicle, and then go ahead with the pulling operation.

Naturally, the coil of wire cable was a bit stiff, and laid around an open space in the center of the compartment. The open space was used to contain another "contraption," which seems to be about the best "kink" which the writer has seen around an automobile. It was merely about twenty feet of coiled wire tubing—"flexible metallic tubing" if you please, either end of which had been fitted with a rubber nipple of such character that when one of the head-lamps was detached from its support in front of the auto, the armored tubing could be slipped over the gas-orifices on lamp and on vehicle, the lamp lighted again, and carried anywhere within a radius equal to the length of the armored tubing. This made one of the handiest things imaginable in case of after-dark repairs being found necessary. With the lamp attached to a convenient tree, and focused upon the interior of the car, a most pleasant reading arrangement was thus provided for use in case of an enforced after-dark roadside wait.

IGNITION TROUBLE.

Less than a week ago I came across a chap who was having all kinds of trouble with ignition in a four cylinder machine. He had changed spark plugs and tested connections theerto until his patience was "beaten to a frazzle." He had put in new batteries, and had performed every one of the regulation stunts for getting the best of an elusive spark. Yet, after all, the ignition could not be depended upon. Sometimes it would work fairly well, then the motor would begin to miss step and occasionally would get "cross-legged" and badly tangled up.

This autoist was sent on his way rejoicing by a very simple deed. The ground wire which was attached to the frame of the "auto," was freed from its connection and another bit of wire attached and connected to the cylinder by clamping the wire under a convenient bolt-head within two inches of the spark plug. The cure proved instantaneous and complete. Not a single mess occurred in firing after the new connection was made, thus showing very conclusively that the trouble was entirely in the poor contacts (electrically) between the several parts of the machine through which the electrical current must pass in order to get back from spark plug to battery again.

A man will find that it pays him to look into this ground connection business when the spark plug does not work as it should. Sometimes the distance of the ground wire from the spark plug, and the number of joints between the stated points will make a great difference in the quality of the spark which any given plug can supply. It should be kept in mind that the ground wire need by no means be insulated. A bare wire for this purpose is exactly as good as one covered with the most expansive insulation, provided that in the placing of the wire in question, it does not come in contact with any portion of the wiring which leads from coil to spark plug. Should there be the least danger of a short circuit, then so arrange and insulate the ground wire that short-circuiting is an impossibility.

CARS USED FOR POWER.

Some of the automobile owners occasionally break out with the idea that a car can be used to advantage for furnishing power for operating machinery. To this end, we hear of one wheel being jacked up and fitted with a belt, the three remaining wheels being securely blocked or otherwise fastened so that the car cannot move in any direction. It is true that considerable power may be transmitted from a car in the position noted above, by means of a belt from the jacked-up wheel. There are, however, several things which should be considered before attempting to make a 25 horse-power stationary motor out of a 40 or 60 horsepower automobile. To begin with, is the very unbusinesslike method of using a $4,000 (more or less) machine to do the work which could be performed equally well—and even better in fact, by a $150 gasoline engine. There is also the wear and tear to which the automobile is subjected while performing a service for which it was never intended. The pull of a belt is quite different from the action of a stated load, vertically applied to the wheel or to its axle. The automobile does not have its bearings designed to carry fore and aft strains upon a single bearing equal to perhaps all the power the engine usually furnishes when in operation upon a road.

Again, there is something happening inside the compensating box when a car is operated with one wheel fastened to the ground. One end of the axle being attached to a fixed object, it is obvious that the other end of the axle will revolve at double the speed imparted to the compensating device by the motor chain. This makes it pretty hard upon the gears inside the compensator. It is putting work upon that mechanism which it was never designed for and the result can only be one thing—the speedy and complete wearing out of the compensating device. If, by any reason, it becomes necessary to use an automobile for the freak purpose of doing duty as a stationary motor, then by all that is fair, jack up both rear wheels and place a belt upon each, driving to two points upon the shaft which is to have motion imparted to it. In this manner, the shaft will run at the same speed as the compensator, and the work on each wheel will be but one-half what it is when a single belt is used. The rearward strain of the belt is also divided, and is carried by two bearings instead of by one, thereby securing a much better distribution of the load.

The Automobile Shows.

Beyond the fact that the automobile shows of this year are more complete and better arranged than any that have preceded them, there is nothing to call out lengthy notice just after they have been exhaustively covered by the daily and weekly press.

Making special reference to the recent show in the Grand Central Palace in New York, and to the Madison Square Garden Show, which is going on at this writing, nothing of a revolutionary character was shown in the design and construction of cars and accessories but an improvement is noticeable all along the line. The tendency is toward larger wheels, to full elliptic springs, to less rather than more cylinders and to further refinement where it has been possible.

Speaking in a general way, a New York paper says that "the doom of the high-priced car has been sounded." Not at all. Prices are not much lower nor will they be. Indeed, the price of automobiles, is at present as low, considering the cost of construction, as horse drawn vehicles, which run all the way from $40 to $1,000. It is true that the standardization of parts and the use of machinery has greatly cheapened construction, but if any one imagines he will ever be able to get a vehicle that carries its own propelling power and that will go as fast on an ungraded highway as a locomotive runs on a private graded track, and that will withstand enormous shocks, for anywhere near the low price of a horse-driven buggy, let him discard the notion at once.

The Grand Central Palace Show was under the management of the American Motor Car Manufacturers' Association, which probably controls more than half the cars made and sold in the United States. The Madison Square Garden Show is under the management of the Association of Licensed Automobile Manufacturers.

At neither of the shows was there much shown in the way of freakish novelties, but at both there were more than the usual number of well designed, soundly constructed and thoroughly businesslike looking cars. It was noticed that a considerable number of the cheaper cars—several listing at less than $1,000—were shown with closed bodies. So far has this tendency gone that at least one of the buggy type of vehicles is shown with a coupe body, operated from the inside. A vehicle of this kind will appeal to the doctor in a small town or country district, as well as to the average farmer. With it at his command he can defy the elements and journey from place to place in entire comfort.

Viewing the exhibits with a special regard for price, it is seen that the car at $500 or thereabouts is no longer represented solely by the buggy type.

The show of heavy trucks was far and away ahead of anything ever before attempted. It clearly reveals the fact that the auto truck is destined to finally displace the horse altogether. Just how soon this will occur, there is no way of telling, but the fact is indisputable.

The display of accessories at both shows was much more interesting and comprehensive than anything of the kind ever seen before in this country. Perhaps the most forceful object lesson of this display was the evidence of the growing popularity of magneto ignition.

The attendance and interest in automobile shows everywhere is proof positive that they have become an established business institution and one that will exist for many years to come.

Some men will take their oath that their batteries are brand new, but oftentimes a test will show that two-thirds of them are all run down.

IMPORTANT MEETINGS

Of the National Retail Automobile Dealers' Association.

The meeting of the Executive Committee of the National Retail Automobile Dealers' Association will take place in the committee room in the first balcony, First Regiment Armory, Chicago, Tuesday, February 9th, at 10 A. M., and the annual meeting and election of officers on Wednesday, February 10, at 10 A. M., in the Quartermaster's room, second gallery, First Regiment Armory.

(Signed) National Retail Automobile Dealers' Association,
C. F. Jensen, President.

In Case of Emergency.

From G. W. L., Pennsylvania.—When you are in want of a grease cup or nut or bolt for some important part, and have not a spare one or means of obtaining one, look round the car and see if there is not one you can "rob" temporarily from a position where it is not urgently needed, or where a makeshift in some form will work satisfactorily. I have often done this, and well remember on one occasion when I found myself by the roadside, "five miles from anywhere," and without a supply of grease which was required to enable me to refit the ball bearings of a wheel—the cone type, not that with the balls in cages—I went round the car and removed the contents from every grease cup I could find, excepting only one or two where a supply was absolutely essential, and in these I left just enough for immediate requirements.

And I call to mind an occasion before I owned a car when the bolts "sheared" which hold the differential casing together, we found substitutes by taking two from each seven securing the four driving pinions to the sliding sleeve in the gear box?

There is one point, however, in this connection which must be observed, and that is the very quickest possible replacement of the pirated part. I know of a case in which a grease cup was lifted and forgotten. The results of this carelessness were not so bad as they might easily have been, although a shaft was seized up. If you feel you may forget, tie your handkerchief round the part. It may not look well, but it will at least save the risk of forgetting.

Starting a Cold Engine.

From O. H. Hampton, Indiana.—Prime the carburetter, then pour a quart of hot water on it, letting the water trickle slowly, so as to get the carburetter and the gasoline in it as warm as possible. If the carburetter has an auxiliary air valve on its top, pour a tablespoonfull of gasoline into the valve, and it is also a help to partly close the main air intake. It is better to let the engine run at moderate speed for several minutes to get it hot before starting the car.

The Eastern Maine Automobile Show will be held at the Auditorium in Bangor during the week of February 15th. This is the first show ever held in that section of the state, and a large number of manufacturers of cars and sundries have already signified their intention of participating. This district furnishes a promising market for automobiles, and this show will furnish an opportunity to place orders for cars early in the season and thus secure their prompt delivery.

OWNERS' LIABILITY.

Supposing His Chauffeur Uses Car Without Consent and Injures Some One.

The Appellate Division of the Supreme Court of New York holds that the owner of an automobile is not necessarily responsible in law for an accident caused by the car while it is being operated by the chauffeur in the absence of the owner.

Three of the Justices hold that even if the chauffeur is running the machine for his own pleasure or use with consent the owner is not responsible. The other two Justices are of the opinion that the owner can escape liability only where it is clear that the chauffeur is using the machine without his employer's sanction.

The evidence showed that Burton S. Castle had given permission to his chauffeur, Harry Boes, to take his car out for his own pleasure. Boes took with him two women and a man, and at 1:30 in the morning the machine struck George Cunningham, who was crossing the street and injured him severely. Justice Clarke, writing the majority opinion reversing the judgment for damages obtained by Cunningham against Castle, says that it is clear that blame for the accident attached to Boes and not to Cunningham, who was using all possible care in crossing the street. But, says Justice Clarke, it was error for the trial Judge to charge the jury that full responsibility for the injuries sustained by Cunningham rested on the owner of the machine.

Justice Clarke says that intrinsically an automobile can no more be classed as a "dangerous instrumentality" and therefore improperly intrusted to the chauffeur than a team of horses and carriage or wagon or a sailboat or motor launch can be classed as a dangerous instrumentality, or even a gun, under certain circumstances. If a gamekeeper borrows his master's gun, Justice Clarke asks, would the master be held liable for any negligence on the part of the gamekeeper that resulted in the shooting of a man when the gamekeeper was using the gun for his own purposes and not for the services of his employer?

"I do not think," says Justice Clarke, "that the question of ignorance or consent of the master has any bearing whatever upon his liability. The fact that the servant has used the automobile without his consent has probative force upon the proposition as to whether or not the servant was engaged in his master's business within the scope of his employment. The question is whether he was or not."

Justice Clarke goes on to say that if the accident had occurred while the chauffeur was taking the machine, say, from the garage to the machine shop to have it fixed, the master would be liable, whether or not he had knowledge of the trip, because the act had happened within the scope of the servant's employment. But if the master were to tell his chauffeur that he could use the machine for his own pleasure while the master was away on a vacation, the master would not be legally responsible for any negligence by the chauffeur during the vacation.

"It may be," concludes Justice Clarke, "that it would be wise and in the public interests that responsibility for an accident caused by an automobile should be affixed to the owner thereof, irrespective of the person driving it, but the law does not so provide."

The remaining two Justices are of the opinion that the act of Castle in giving his consent to the private use of the machine by the chauffeur, made the owner responsible for the accident. As they view it, the chauffeur was technically still on his master's business and the relationship of master and servant had not been severed.

But the dissenting Justices are of one accord with the majority of the Court that if the chauffeur had taken the machine out without the consent of his master and contrary to the latter's orders, there would be no liability of the master. It is expected that an appeal will be taken.

A Loose Gear Lever.

From W. C. B., New York.—I saw a car totally incapacitated by a very simple accident the other day. The owner drove it on to the grass by the roadside, intending to leave it there while watching a club event. He pulled his gear lever back into neutral, pushed on his side brake and turned to greet a friend before switching off the ignition. The engine was running rather fast, and its vibration shook the gear lever out of neutral into first speed. The car was immovable, partly owing to the hummocky nature of the ground, partly owing to the excellence of the side brakes. Something had to go, and the something happened to be the radius rods, which crumpled up like rolls of paper, although amply strong enough to serve their proper purpose. On the car in question the gear quadrant is a plain, single arc of metal, with nicks along one side for the various positions, and the lever is a straight bar with a small pawl on one side. It is pressed against the quadrant and into the nicks by means of a spring. Unfortunately, this spring has to transmit its pressure at right angles, and at a level of 8 inches or so above the spindle on which it is coiled. The lower end of the lever has a hole, into which is fitted a spindle 8 inches below the quadrant, and this end is held up against a stop by a coiled spring on the spindle. This pressure proved quite insufficient to hold the lever in the neutral nick against engine vibration—hence the smash. Now we small car men don't expect complicated gate systems for our money, but we do demand a quadrant or other device which shall hold the gear lever absolutely rigid wherever we put it; and I regret to say quite a number of small cars are not proof against this sort of mischance. Owners of such cars should improve on the locking device without loss of time, as sooner or later such a car is quite likely to start off itself down a crowded street and do a lot of damage. I remember seeing one of these faulty cars start off on the reverse while its late occupants were dismounted; and one owner actually told me with pride he could change gear by tapping the lever with his foot! This particular type of automatic gear change is not to be recommended.

Sticking Valves.

From O. H. Hampton, Indiana.—If the valves are accessible, it is not a bad plan to push them open by placing the end of a stick against the end of the valve stem. Do this before starting on a trip while the valves are cold and do it on coming in while they are hot. If the engine is standing in such shape that a valve is held open, turn the engine until the valve is closed. Attention of this kind will frequently head off a tendency to begin sticking.

A tire expert has found that a 60-mile speed raises the temperature inside the tube to about 150 degrees, with 220 at the tread, and with greater pace it increases rapidly, generally causing them to burst.

There are many indications, both at home and abroad, that the most numerous cars in the coming shows will be of moderate power.

Air or Water Cooling.

The air cooled motor is still struggling for popular favor. Of course water cooling is now far ahead in use and consequently in popularity. The water cooling makers, while not denying the capability of the air cooling method, and while admitting the force of the argument that their radiators and fans are for the purpose of ultimately delivering the excess heat to the air, continue this method because of the success of the past with it and the hold it has with the average American buyer. While the motor buggies almost without exception use air cooling, the larger vehicles and touring cars are almost equally unanimous in the use of water. Among the water-cooled vehicles, the majority secure circulation by some form of pump, although others use natural circulation. The advantage of the natural circulation is that the pump is omitted, the slight power required to drive the pump is saved, its impossible noise and trouble are eliminated and the first cost of the vehicle, as well as its probable maintenance expense, may be lower.

In the case of natural circulation, the water heated by the cylinders rises and passes to the radiator, where, being cooled, it falls to the bottom and again returns to the cylinders. This action does not begin until the cylinders warm, and is slow or fast, according to the heat of the cylinders, thus being largely self-regulating and thermostatic. The advocates of the pump methods of circulation claim that a more rapid circulation is maintained, which permits smaller piping and smaller radiators, as well as insuring greater certainty from boiling of the water, with some loss thereof from the radiator.

It is therefore largely a matter of choice to the buyer whether or not he prefers the possibilities of trouble with the pump and its requirement of power, or whether more frequently to replenish the water supply carried on his vehicle.

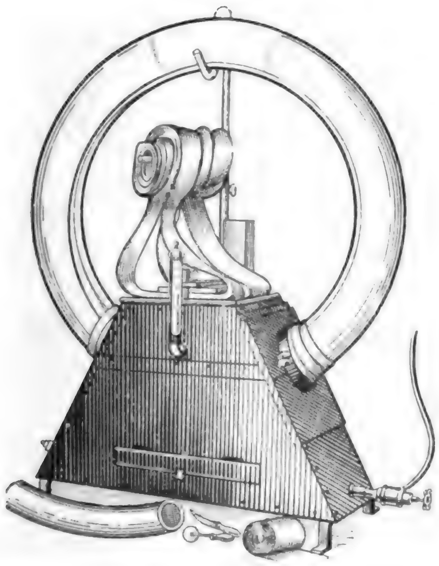
As to air or water cooling, both are satisfactory, and the method likely to survive will depend on the attitude of the purchaser.

Drain Off All the Water.

Recently an automobile garage in Cincinnati purchased a water-cooled car second-hand. The car was shipped from Bath, Me., and when it arrived the cylinder jacket, the water radiator and other parts of the cooling system were badly damaged, owing to the negligence of the shipper in not draining the water out before making shipment. This can only be characterized as unreasonable neglect, and can hardly be charged against the type of power. And many of the things about automobiles which make mechanics designate them as unsatisfactory are just such incidents as this, due in most cases to neglect or to ignorance. The driver who does not know that he must have ignition current and who fails to know before starting out whether or not he has a good ignition current is going to have trouble which is not chargeable to the type of car he has, but to his own lack of appreciation of the necessity of things. In the beginner such experiences are to be expected somewhat, and the beginner's aptitude is good if they happen but once.

A New Vulcanizer

Illustrated herewith is the "The-Save-Tire Garage Vulcanizer," and although no full description has as yet appeared as to the details of how it works, the claims made for it and the price are unusually attractive. It is said that it will make any kind of repair on any size or make of tire or inner tube. It



"THE SAVETIRE" VULCANIZER.

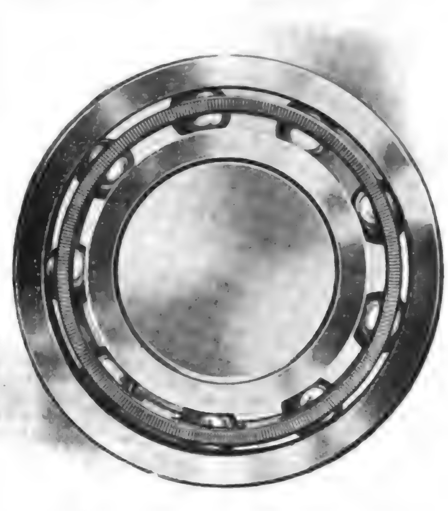
is light in weight, easily placed anywhere, and enables the car owner or chauffeur to keep tires in repair at a trifling cost. The price is but $25, and this includes attachments for either city gas or the acetylene gas of the car, with thermometers, cores, tools, etc. For full information address The Savetire Co., Grand Rapids, Mich.

CARBURETOR TROUBLES.—The "Watt-Detroit" Carburetor Co., 66 Griswold St., Detroit, Mich., does not seem to think that THE AUTOMOBILE DEALER AND REPAIRER is good for much as an advertising medium. This company, however, has consented to try our magazine for a single month. Of course one issue is no fair test for any publication, but we are taking our readers into our confidence, and believe they will demonstrate the value of our publication. If the "Watts-Detroit" Carburetor is as good as the manufacturers claim, and concerning this we have no personal knowledge, we are sure that many readers will want one. The manufacturers say that your money will be promptly refunded if their carburetor does not work right. This seems a fair and honorable proposition; but write for their catalogue and price list, and please mention THE AUTOMOBILE DEALER AND REPAIRER. We want to show this company that our magazine is a much better advertising medium than they think it is.

VANGUARD WIND SHIELDS AND BUMPERS.—These excellent wind shields and bumpers are built of the finest materials. They are mechanically perfect and so constructed that they become an integral part of cars to which they are attached. Consult the advertisement of the Vanguard Manufacturing Co., 112 Cass St., Joliet, Ill., which appears in another column. Also write them for catalog and prices, not forgetting to mention THE AUTOMOBILE DEALER AND REPAIRER. Watch for the new spark plug which will be exhibited by this company at the Chicago Show.

R. I. V. Ball Bearings.

A line of very practical and satisfactory ball bearings of both the annular and thrust type is furnished to the trade by the R. I. V. Company of New York. They make two new forms of ball retainers or spacers, which are shown, one of babbit metal cast around the balls in one piece, and the other consists of two sheet steel stampings which fit around the balls and also have a continuous pocket or well in which the oil or grease is stored and kept continually in contact with the balls to prevent rust or corrosion. R. I. V. bearings were used exclusively in the Fiat and Lancia winning cars at Savannah, and by Nazarro in the Targo Florio Cup race.



R. I. V. BALL BEARING, MEDIUM WEIGHT TYPE.

Manufactured by the R. I. V. Co.
1771 Broadway, New York City.

These bearings are giving especial satisfaction for repair work. Repairmen and individual car owners throughout the country should be interested. Write for interesting free catalogue to the R. I. V. Company, 1771 Broadway, not forgetting to mention the AUTOMOBILE DEALER AND REPAIRER.

Woodworth Treads for 1909

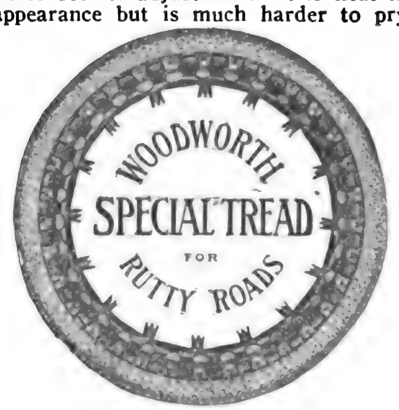
The 1909 catalogue of the Leather Tire Goods Co., Newton Upper Falls, Mass., is just out. It shows some changes and improvements in Woodworth Treads and Kant-Skids, and also a considerable reduction in price.

The Tread with strap and buckle adjustment which has been so popular for the last two seasons is now called

WOODWORTH SELF-ADJUSTING TREAD

the Adjustable. It is similar in appearance to the 1908 style, but has been improved by putting a reinforcement of Egyptian fabric between the outer and inner plies of leather, relieving the leather of most of the strain, so that it will give much longer wear. The studs are set a little closer than in the past, which also increases the durability. The Special Tread for rutty roads is similar to the 1908 styles, but it also has the reinforcement between the leather and the closer set studs.

A new Tread called the Self-Adjusting is shown for 1909. It is held on the tire by crimped side wires fastened close to the side of the tire by short loops which have no adjustment. This Tread depends wholly on the spring of the wires for its adjustment. It is neat in appearance but is much harder to pry



WOODWORTH SPECIAL TREAD

over the tire than the adjustable style. It is not suitable for rutty roads and is not made with the rivets in the sides. The self-adjusting Treads, besides being made in the steel-studded style, is made with a thick strip of rubber on the middle or wearing portion, and is then called the Woodworth Self-Adjusting Rubber Tread.

This Rubber Tread is somewhat higher in price than the studded style, but it will give long wear on any roads that do not cut the rubber. It is practically puncture-proof and on account of the cushioning effect of the rubber it adds considerably to the smooth running of the car.

The Kant-Skid is a device similar to tire chains, but has cross-strips of leather studded with steel rivets. These protect the tire to a considerable extent, and it is claimed for them that they wear much longer than chains and hold

WOODWORTH KANT-SKID

more firmly on the road. The cross-strips are held by a very ingenious arrangement that enables one to remove old sections and put in new ones in a moment without tools These sell for about the same price as chains.

The Single Kant-Skid is a chrome leather strap studded in the middle, intended to be held across the tire by buckling each end around a spoke. These are intended to be carried in the machine for use in pulling out of soft or

WOODWORTH REPAIR BOOT

slippery roads but by placing about six on each wheel they may be used permanently. The Woodworth Repair Boots, Emergency Straps and Crome Leather Patches are intended only for repairing a bad shoe temporarily. They are guaranteed of the best quality and are low in price.

The catalogue is one that will be interesting to every automobilist. It can be obtained by writing to the Leather Tire Goods Co., Newton Upper Falls, Mass. Do not fail to mention The Automobile Dealer and Repairer when you write for this catalogue.

Schrader's Universal Valves.—The Schrader Universal Tire Valve is a simple and air-tight valve, which can be supplied to the trade by all tire manufacturers. It is the regular equipment for G. & J. Motor Tires, Hartford, Dunlop Detachable Motor Tires and new Goodyear Detachable Motor Tires. Write for interesting free literature to A. Schrader's Son, Inc., 34 Rose St., New York City, not forgetting to mention The Automobile Dealer and Repairer.

Universal Auto Tire Remover

This is the latest idea in mechanical appliances for removing tires, and it seems to fill a decided need. It is claimed that it does away with the use of a hammer, fingers or temper, and thus keeps rims, rings, tubes and casings. It is simple, strong and will do the work of all other tools combined.

It is easily adjusted and can be used on any size tire or rim. It is a compound lever, so constructed as to get the greatest power with the least effort; it is about twenty inches long and weighs

UNIVERSAL AUTO TIRE REMOVER

about four pounds. It is so constructed that it is impossible to get out of repair. No car is fully equipped unless you have this invention in your tool box; full directions sent with each tool.

The price is low, and it is powerful, safe and cannot get out of repair. For further information address the manufacturers, The Auto Tire Remover Co., 948 Market St., San Francisco, Cal.

Ignition Equipment.—Our readers, most of them perhaps, will be interested in the half-page announcement in this issue of the Hoyt Electrical Instrument Works, Penacoock, N. H. They say in their advertisement, "It matters not how efficient your motor and ignition equipment may be, it cannot remain so unless the adjustments are made with precision." The Hoyt system, it is claimed, insures greatest efficiency and freedom from ignition troubles. If this is the case, every one of our readers is interested in it. You can't tell much about the matter by reading a short advertisement, and so this concern desires to place their bulletins in the hands of every person operating a gasoline motor, and they will be sent free of charge. Write for them and mention The Automobile Dealer and Repairer.

Tourist Oil and Gasoline Kit.—We feel sure our readers will be interested in the announcement in this issue of the Dover Stamping & Mfg. Co., 381 Putnam Avenue, Cambridge, Mass., in which will be found illustrated and described their oil and gasoline kit for tourists. It is described as being a neat, compact and dust-proof device for carrying extra oil and gasoline when touring. It can be instantly attached and as quickly detached. But send for catalogue giving further particulars of this, as well as many other automobile specialties and mention The Automobile Dealer and Repairer.

Feed Pipe Nuts.

When a gasoline feed pipe has been uncoupled for cleansing, some difficulty will occasionally be encountered in replacing it, especially if the nuts be inverted and slightly inaccessible. It will be found of great advantage to turn the first thread or two off both nut and shoulder, to ensure accurate centering of the joint before a spanner is applied. Should the union leak a little on the road, the cone should be held tight against its shoulder, and the inside of the nut plentifully smeared with common soap. The nut may then be pushed up over the cone and locked, when the leakage will be found to have ceased. These unions are usually made of soft metal, and to avoid straining them it is essential to give the nuts at each end of the pipe a turn apiece in order instead of first tightening one end and then forcing the other end into engagement.

ONE GOOD DEALER

IN EACH TOWN WILL SELL

French Auto Non-Carbon Oil

EXCLUSIVE AGENCY.

Our Advertising Dept. will assist.

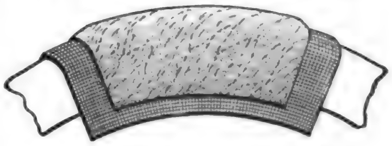
You'll have to hurry.

MARSHALL OIL COMPANY

Exclusive American Distributers.

MARSHALLTOWN, IOWA.

Gray's Insert for Blow-outs



Sent prepaid on receipt of $1.25

State Size of Tire

Standard Leather Washer Mfg. Co.

45 Clinton St., Newark, N. J.

SPECIAL TYPE MODEL C. FOR FORD, S.N. R. & T.

This, a type made specially for this car, is easily attached and adjusted; no fitting required. Gives more power. Finest throttle control at all speeds. Saves gasoline and runs engine cooler. Is giving satisfaction in cases where four different makes had been tried before ours. Low in price, but high in quality. Satisfaction guaranteed or price refunded. Send for 1909 catalog.

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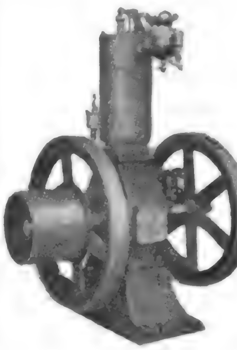

THE GARDNER Gasoline Engine can be used for your machine shop, driving air compressors, dynamos, or any other purpose where a reliable, efficient and economical power is wanted. Built of the best material throughout. They stand up under the hardest service. Write for printed matter. The price is right. We want reliable agents in all parts of the country.

The Gardner Motor Car Co.

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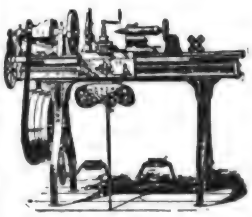

THE BARNES LATHES

9" swing
11" swing
13" swing

For Repair Work our No. 13 Lathe is right; has 13" swing, auto cross feed, length of beds from 5 to 10 feet long; furnished with countershaft or foot-power.

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Manufacturers of
Blue Flame Kerosene Burner,
Safety Water Tube Boiler,
Automatic Water Regulator,
Automatic Fuel Regulator,
Feed Water Heater,
Compound Steam Engines,
New Automatic Fuel Feed.
For all makes of steamers, including White's and Stanley's. Write for new Catalogue.

STEEL CASTINGS

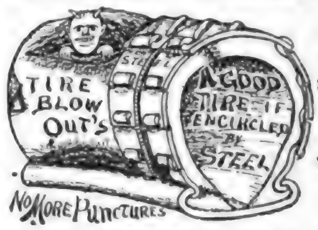
Automobile Work a Specialty.

PROMPT SHIPMENTS.

Crucible Steel Casting Co.

LANSDOWNE, PA.

PROTECT YOUR NEW TIRES. REPAIR THE OLD ONES.



Tires Will Last Forever

Steel Link Bands

Hooks to Rim

You can fix Blowout quick. If tire is completely covered by these clasps you cannot have Blowouts, Punctures, Rim Cuts or Wearing off of tire. (Any old tire is good. How can it get away if encircled by steel?) As flexible as ever. Anti Skid.

KIMBALL TIRE CASE CO., 174 B'way, Council Bluffs, Ia.
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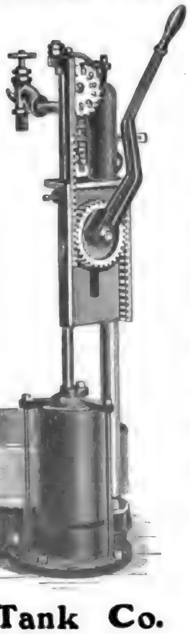
Eastern Self-Measuring Pump

Our 1907 Model, shown herewith, will quickly pay for itself in any garage.



Convenience, Economy, Safety.

Not one drop of Gasoline wasted.

Gasoline Tanks, Pumps, Complete Storage Outfits.

Get full information by writing to

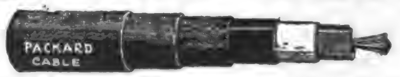
Eastern Oil Tank Co.

Lowell, Mass., U. S. A

KE-PA-GO-IN TIRES

For discriminating buyers. No Skidding. No Punctures. No Trouble. They just Keep agoin'. Ask the users.
BEEBE-ELLIOTT CO., RACINE, WIS.

PACKARD CABLE



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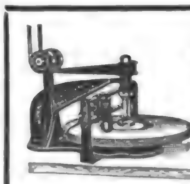
THE PACKARD ELECTRIC CO., Warren, Ohio.

4x4 AIR COOLED MOTORS

$80.00 each for Feb. only
Transmissions,
$23.00 each.
Write for Catalogue.

AUTO PARTS CO., 52 West Jackson St., Chicago, Ill.



CLIPPER SHARPENER and SURFACE GRINDER
Profitable in Every Repair Shop
Clippers sharpened in five minutes, earning 50 cents. Descriptive circular and prices, address
John Van Benschoten
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All Styles.

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TUTHILL SPRING CO.,

221 W. Polk Street, - - CHICAGO, ILL.

"Knipe" Pat.

Ball Bearings. Steel / Brass } **Balls.**

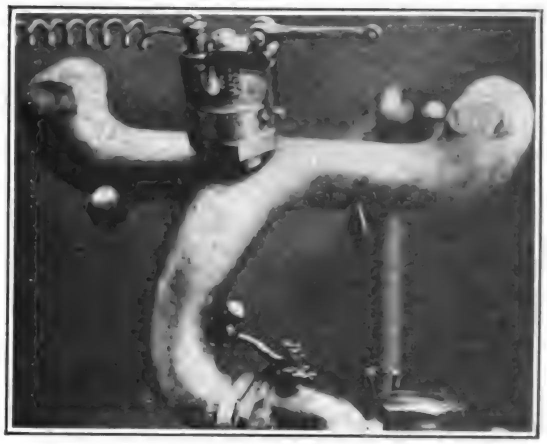
¼ Inch Shaft and Up.
No Fitting. Just Push Them On.
10 Cents in Stamps for Sample.

PRESSED STEEL MFG. CO.,
454 The Bourse, Phila., Pa.

M and S Controller and Economizer

WHAT IT WILL DO

It gives the Operator control of Engine, thus avoiding accident.
It allows Car to coast without disengaging the clutch.
It allows the Engine to take in cool air, thereby greatly facilitating the cooling.
It prevents violent back-firing in the Carbureter
It assists in lubricating the Cylinders.
It increases the life and efficiency of the Engine.
It prolongs the life of a car.
It makes it possible to run a car on low gear any number of miles without overheating.
It is indispensible for racing or speeding.
It prolongs the life of batteries, spark plug and coil.
It costs little, gives no trouble and will last life of Car.



This Attachment is very simple, can be applied to any existing type of internal combustion Engine by any ordinary Mechanic.

Any car with this Attachment with one or any number of cylinders, whether two or four cycle, the Motor can be instantly cut out without interfering in any way, and without throttling the mixture as it instantly cuts off the combustible mixture and ignition, leaving the car to run with its own momentum and economizing the fuel.

SEND AT ONCE FOR CIRCULAR WITH PRICE LIST

DISCOUNT TO DEALERS

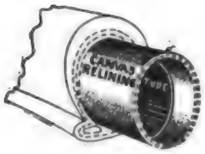
Every Attachment **fully guaranteed.** Money refunded if not satisfactory.

WM. MOLLER & CO., Lewistown, Pa.

WE CAN MAKE YOUR TIRES LAST TWICE AS LONG.

It's the canvas of a tire—which GIVES out BEFORE THE RUBBER IS HALF WORN OUT. We RENEW the entire canvas, shipping it to you fully stretched, formed and ready to insert.

Easily Applied. Inexpensive.

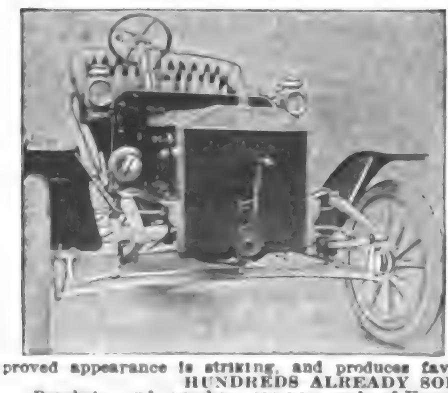


Endorsed by Leading Garages and Owners.

DON'T WAIT until the tire is all shot to pieces (although we frequently give discarded tires an extra season's use) but PREVENT BLOW OUTS and RIM CUTS by relining ANY TIRE NOW, if it has had from 4 to 6 months' ordinary use. Every owner and every garage man that is not posted, should write at once for our booklet.

Mention the Automobile Dealer and Repairer.

INNER SHOE TIRE CO., Grand Rapids, Mich.



Shumard's Front Spring Outfit for Ford Cars.

Patents Pending.

The most decided improvement ever made on a finished car of standard manufacture.

The difference in the riding and operating qualities is noticeable at once, and the surprise is a delight.

The safety of the outfit over the single spring cannot be figured in dollars and cents.

The greatly improved appearance is striking, and produces favorable comment.

HUNDREDS ALREADY SOLD.

Brackets and perches are now made of Vanadium steel with a tensile strength of more than 140,000 lbs.

Springs are the finest quality, tempered in oil, and carefully tested.

Finished, painted and carefully packed in wood box.

Liberal discount to legitimate dealers. Write for further particulars and price to

THE SPECIAL MOTOR VEHICLE CO., Cincinnati, Ohio.

Thermoid

Brake Lining

Is Used Exclusively by the Particular

A CAT HAS NINE LIVES—YOU DON'T

Therefore safeguard the one you have and—use Thermoid on your brakes. Then you're sure.

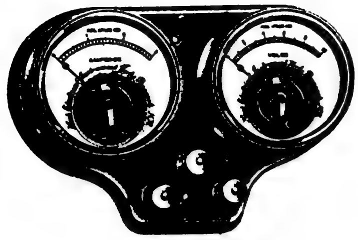
TRENTON RUBBER MF'G CO.,

TRENTON, N. J.

Special Request

IN writing to advertisers for circulars or information, you are earnestly requested to mention in each case that the advertisement was seen in the "Automobile Dealer and Repairer." By so doing you will confer a favor on both publisher and advertiser

The Year 1909 Opens With Bright Promises



Not the least of these is the tendency towards saner methods in the use of Ignition Equipment. Who would think of operating a steam boiler without suitable gages, or a dynamo without meters; yet the Ignition System, upon which every impulse of the motor depends, is too often operated by rule of thumb. It matters not how efficient your motor and Ignition Equipment may be, it cannot remain so unless the adjustments are made with precision. The Hoyt System of Testing insures increased efficiency and freedom from Ignition troubles. Bulletins A.R. should be in the hands of every person operating a gasoline motor, and will be sent FREE on request.

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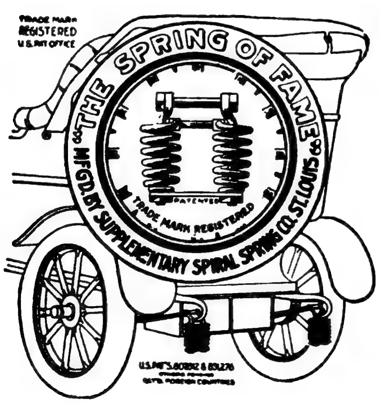
SAVE YOUR CAR

BY ATTACHING OUR



Supplementary Spiral Spring

OVER 15,000 IN USE

Send for "MISSOURI PROOF"—we show you—and our 1908 BOOKLET—it's interesting.

Beware of worthless makeshift single or double coil imitations and infringements.

Liberal NO RISK propositions to the trade.

WHAT OTHERS SAY:

"100,000 miles and not a broken side spring."
C. W. NUGENT, St. Louis.

"Am thoroughly satisfied with them."
E. W. GIBSON, The Point, Tasmania.

"They ride extremely nice."
BRITISH-AMERICAN CO., Coventry, England.

"They are everything you claim for them."
Dr. F. E. BUCK, Jacksonville, Fla.

"I cannot understand how I did without them."
LEOPOLD KAHN, New York City.

"Make the car ride very comfortably."
S. N. BRIGGS, Los Angeles, Cal.

"I cannot praise them enough."—H. L. TURNER, Boston.

The above extracts from a select few letters recently received give an idea of the range of territory in which the Supplementary Spiral Springs are popular. We have too many to print.

SUPPLEMENTARY SPIRAL SPRING CO., Inc. Main Office, 4522 Delmar Ave., ST. LOUIS, MO.

NEW YORK BRANCH, Motor Mart Bldg., 1876 B'way. BOSTON, 889 Boylston. CHICAGO, 1218 Michigan.
PACIFIC COAST, 424-446 Stanyan St. San Francisco.

WANT ADVERTISEMENTS.

Under this head will be printed advertisements of shops for sale or to rent, or shops wanted, or situations or help wanted, or tools or machines (second-hand) wanted or to exchange, at the uniform price of two cents a word, which will include the address, for each insertion, payable in advance. No advertisement will be inserted for less than 30 cents, however small.

Remittances can be made in postage stamps if more convenient. Address,

MOTOR VEHICLE PUBLISHING CO.,

24 MURRAY STREET, NEW YORK.

STEAM CAR OWNERS—Subscribe for Steam Motor Journal, monthly devoted to steam cars. 1409 Welton street, Denver, Col. Price, 15 cents; $1 year.

UNIVERSAL FLUXINE brazes castiron; guaranteed; any one can do this work with regular brazing equipment. Send 50 cents stamps or currency for pound. Universal Fluxine Co., Urbana, Ohio.

WOULD LIKE to purchase good second-hand transmission for Oldsmobile, Model 1903. Address L. F. Stillian, North Branch, Iowa.

FOR SALE

AUTOCAR 1906 touring car, 20 h. p. four-cylinder motor; new top and wind shield; fine condition; bargain. O. C. Snyder, Bethlehem, Pa.

FOR SALE—Five-passenger Rambler surrey; new engine and new tires; price, $400, or will exchange for machinery; also runabout, all complete, with top, ready for power; price, $200; pressed steel frame, 104-inch wheel base, $25; four-horse stationary gasoline engine $75. Address Central Supply Co., Richland, Pa.

FOR SALE—Steam Automobiles; write for illustrated bargain list. F. W. Ofeldt & Sons, Nyack, N. Y.

FOR SALE—Six-cylinder automobile coil. 14 h. p., 4-cylinder, 4-cycle, air-cooled automobile engine. Set of 3x28 inch solid tires. A 6, 8 and 10 h. p. stationary engine. Low price on the above. F. Booth, Stanley, N. Y.

FOR SALE—Engines, axles, transmissions, frames, bodies, carbureters, timers and auto parts generally at bargain prices. Tell us what you want. The Logan Construction Co., Chillicothe, Ohio.

TOPS—Until further notice, runabout tops $20, touring car tops $35. C. G. Meyer & Son, Tiffin, Ohio.

RADIATORS and lamps repaired by experts. Ship to us and follow with letter. Auto Rebuilding Co., 1349 Michigan Ave., Chicago, Ill.

FORD RUNABOUT OWNERS—Now is the time to order outfit to change your N. S. or R. into new "S" roadster, new fenders, and rumble seats, dash hoods, folding hoods, glass fronts, tops, oilers, magnetos. Write for catalogue to-day. Auto Rebuilding Co., 1349 Michigan Ave., Chicago, Ill.

RUMBLE SEATS and "baby" tonneaus, for Ford, Maxwell, Buick, Cadillac and other cars, fenders, radiators, hoods. We are the big mail order rebuilding house. Send for catalogue. Auto Rebuilding Co., 1349 Michigan Ave., Chicago, Ill.

6-CYLINDER Auto Coil, 14 horse power; 4-cylinder 4-cycle Air-Cooled Auto Engine; set of 3-inch by 28-inch solid auto tires; a 6, 8 and 10 horse power stationary engine; a 5 and 7 horse power marine engine; a 10 horse power Fox valveless steam engine; a typewriter, an office safe and a quantity of hack saw blades. Low prices on above. Address F. Booth, Stanley, N. Y.

1906 CAMERON, 3-cylinder, 15 h. p., shaft drive, sliding gear tourabout; fine shape; $480. A few Typewriter, Violin and Harp bargains; also some tools and 2 h. p. boiler and engine. Chas. Berg, Le Mars, Iowa.

4-CYLINDER SPLITDORF Dash Coil, $16; same, brand new, $24.50; four brand new 28x2½ Woodworth Treads, $29; four new inner tubes, $1.95 each; five same, used, but air tight, each $1; four brand new 28x3 casing and tubes, Fox brand, $14 per tire. Chas. Berg, Le Mars, Iowa.

FOR SALE—Buick Touring Car, Model F, 1907; run less than 6,000 miles; engine perfect condition. Address Box 237, Fayette, Iowa.

FOR SALE—1¼ h. p. steam engine, 1½ h. p. boiler, nearly new, $25; 5 h. p. air-cooled auto or marine engine in good running order for $20; marine engine, 2-cycle, in fine running condition, with spark coil, reversible propeller and batteries, $45; one make and brake spark coil, $3. Address Roy Dutcher, 1507 4th St., Kalamazoo, Mich.

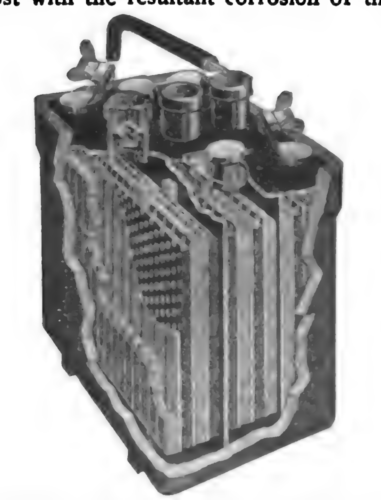
FOR SALE — Two 1908 Indian Motor Cycles, nearly new, 2¾ and 3½ h. p.; ran 400 miles; $150 and $170. Guaranteed. Write us. Renner Repair Co., New Midway, Md.

FOR SALE—A 16 h. p. Autocar, opposed engine, carbureter, water pump, muffler, ball bearing, sliding gear, three speeds, forward and reverse; fine running order; nearly new. Will take $100. Send $25 down subject to examination. Address Robt. Roldecker, Box 7, State Center, Iowa.

FOR SALE—A seven-passenger Thomas flyer automobile, Model 36-60 h. p. In perfect condition, with six tires and four extra inner tubes, gas tank, glass front and trunk rack, a complete outfit. If taken soon will sell at a great bargain. Address Lee Van Reed, Williamsport, Ind.

GEISZLER STORAGE BATTERIES

On our inside front cover this month readers will find an attractive announcement from Geiszler Bros., illustrating their original Non-Sulphating Storage Battery. They make a remarkable offer on this battery. Their size 66, six volts, 60 ampere hours, is sold at the remarkably low price of $15. This battery has never failed to give complete satisfaction, and it is fully guaranteed for one year. A sectional view of the battery is shown herewith. As this battery has already been quite fully described in our columns a further description is hardly necessary. No material change in the battery has been made for the season of 1909, but new style corner posts are used. These posts have been fully tested with excellent results, as they have practically overcome, it is claimed, the disadvantages of corrosion of the terminals binding posts—a common trouble with storage batteries. The method employed consists of lead-burning a new cast corner post onto the plate connector after battery has been fully formed and sealed, the result claimed being that the corner post has never become wet from the acid as is the case in other batteries. Once the lead has been wet during the forming process the surface of the post has such an affinity for the sulphuric acid that should a single drop come in contact with any part of the post the acid will creep over the entire post with the resultant corrosion of the terminal bolts and screws. Write for free catalog to Geiszler Bros., 518 W. 57th St., New York City, and mention THE AUTOMOBILE DEALER AND REPAIRER.



GEISZLER STORAGE BATTERY SECTIONAL VIEW.

Manufactured by Geiszler Bros., 518 W. 57th St., New York City.

AUTO CONTACT BATTERY BOX.—Many of our readers will be interested in the announcement in this issue of A. Hall Berry, 97 Warren St, New York, manufacturer of the Auto Contact Battery Box. "No wires, no tools, no fuss," as he says in his advertisement. Any standard dry cell can be used, but to learn more about it write for descriptive circular with price, and mention THE AUTOMOBILE DEALER AND REPAIRER.

THE GARDNER GASOLINE ENGINE.—This engine is especially recommended for the automobile repair shop, or for any purpose where first-class, reliable service is necessary. Write for interesting printed matter to the Gardner Motor Car Co., 5145 Delmar Boulevard, St. Louis, Mo. In writing them mention THE AUTOMOBILE DEALER AND REPAIRER.

SHALER ELECTRIC VULCANIZERS

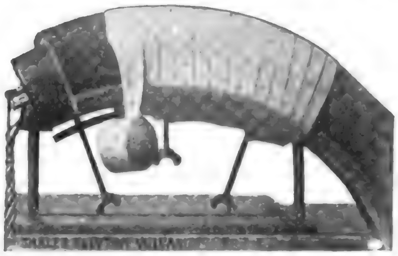
DULUTH, MINN., Oct. 28, 1908.

C. A. SHALER CO., WAUPUN, WIS.:

Gentlemen—Your vulcanizer is in use every hour, and we have found it to be by far the best that we have ever used. We have discarded two other makes. The Shaler is O. K.

Yours very truly,

RUSSELL MOTOR CO.



A Type C and a Type B "SHALER" make the most complete garage equipment on the market, and will do any work that is practical on any Auto Tire. Heat is generated by simply attaching to city current, and about ½ cent's worth of current is used in an hour. It takes only a few minutes to get the right heat, which is maintained automatically.

C. A. SHALER CO., Mfrs., WAUPUN, WIS., U. S. A.

Empire Tires WEAR LONGEST

EMPIRE AUTOMOBILE TIRE CO. . . . Trenton, N. J.

BRANCHES
New York City..73d St. and Broadway
New York City.......148 Chambers St.
Chicago...........1301 Michigan Ave.
Chicago...............20 La Salle St.
Detroit...........842 Woodward Ave.
Boston..........292 Devonshire St.
Newark, N. J.........264 Halsey St.

AGENCIES
Buffalo...........Empire Sales Co.
Philadelphia..Penn Auto Supply Co.
Atlanta, Ga....Dunham Rubber Co.
Pittsburg, Pa., Consumers' Auto Supply Co...7th Ave. & Smithfield St.
Kansas City, Mo., Empire Tire & Rubber Co.....1412-14 W. 11th St.
Jacksonville, Fla..Savell Rubber Co.
Norfolk, Va.........Wm. H. Grover
Denver, Colo.....Denver Auto Goods Co.
Los Angeles, Cal..Pacific Electrical W'ks
Savannah, Ga...........Harris Tire Co.
New Orleans, La..........H. A. Testard
Minneapolis, Minn..Emp. Tire & Rub'r Co.
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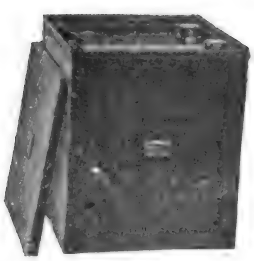
TOURIST
Oil and Gasoline Kit



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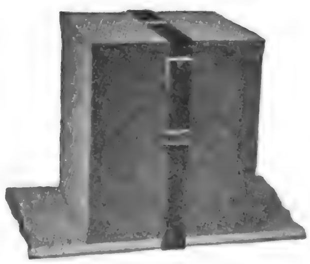


Attached to Running Board.

A neat, compact and dust-proof device for carrying extra oil and gasoline when touring

Instantly attached and instantly detached

Furnished with strap complete

Consists of a fine black enamel steel case, which may be instantly strapped to the running board. Contains two special enameled cans (9 in. x 4½ in. x 9¾ in.) having a capacity of over 1½ gallons each, with special pouring spout and filler cap.

Send for our new Catalogue of Auto Specialties

Dover Stamping & Mfg. Co.

383 Putnam Avenue, Cambridge, Mass.

THE NEW 1909 MODEL OF THE

"Ideal" Lawn Mower Grinder

"You Grind it as You Find it."

The 1909 Model of the Ideal Lawn Mower Grinder grinds the Reel Knives to fit the straight blade, even if the latter is bent and out of shape—something never done before, and the most important feature of lawn-mower sharpening. Has 5-in. ball-bearing grinding wheel, babbitted bearings, twice as easy running as any other. Grinds either right or left-hand Mowers perfectly in fifteen minutes without removing ratchets or wheels. We are the originators, and six years' experience has shown us how to make them perfect.

Send for circular giving full information and prices. WRITE TO-DAY.

The Heath Foundry and Manufacturing Co.

Successors to The Root Brothers Company

Plymouth, Ohio

Classified Buyers' Guide.

Index to Advertisers.

HERCULES PORTABLE CRANE HOIST.—In this issue Wm. S. Nicholls, Hoosick Falls, N. Y., has an announcement with an illustration of his Hercules Portable Crane Hoist, which ought to interest a great many of our readers and probably will. The engraving in this advertisement shows just how it looks, so that an extended description is unnecessary. He would like to send a descriptive circular with price to every reader who may be interested. Write for it and mention THE AUTOMOBILE DEALER AND REPAIRER.

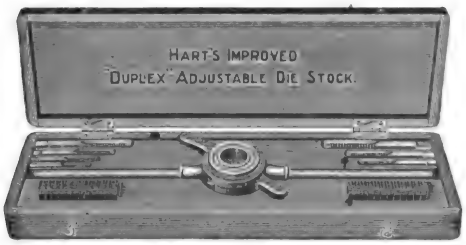
WILL SAVE YOUR GASOLINE.—The "G. L. Economizer" when attached to any carburetter will make a large saving of gasoline. The manufacturers state that with this device any car owner may secure perfect carburation, greater flexibility and at the same time the invention will effect a saving of fully 25 per cent. on the gasoline bills, which constitute one of the most important items in the cost of operating a car. The device sells at retail for the moderate sum of $5.00. The manufacturers absolutely guarantee the Economizer and if it does not do all they claim for it your money will be returned. Write for new and extremely interesting 42-page catalog, sent free and postpaid, on request. Address The G. L. Economizer Co., 1410 Times Building, New York City. In writing please mention THE AUTOMOBILE DEALER AND REPAIRER.

A GOOD GREASE GUN.—The grease gun manufactured by Miller & Starr, of Brooklyn, N. Y., is admitted to be one of the best on the market, and every car owner, garage owner or dealer should be interested in it. This gun may be filled and equipped in 30 seconds. Good agents are wanted everywhere. Write for circular and prices to Miller & Starr, 250 Greene St., Brooklyn, N. Y., and mention THE AUTOMOBILE DEALER AND REPAIRER.

A NEW LINE.—The Auto Cle automobile wrench formerly manufactured by the Quincy, Manchester, Sargent Co., is now made by the Frank Mossberg Co. Distribution of the Auto Cle and Titus Cle wrenches will be made from their office and factory at Attleboro, Mass.

SHARP DIES

Are what are needed to cut good threads, and you can always have them if you use a



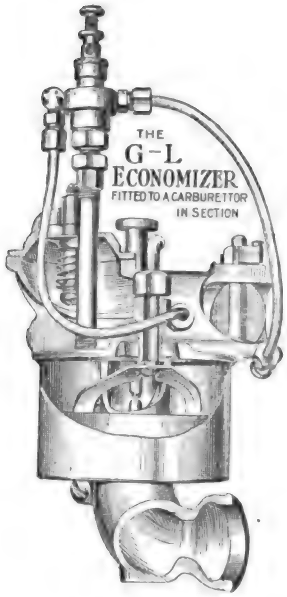
"DUPLEX" Die Stock Set

The dies in these sets are easier to sharpen than a knife; this fact enables you to get the full wear out of them. A. L. A. M. and other standards of threads.

WRITE US

THE HART MFG. CO.

1362 E. 3rd St., CLEVELAND, O., U. S. A.



ATTACH A

G. L. ECONOMIZER

To your Carburettor and get

Perfect Carburation

Greater Flexibility

AND

25 Per Cent. Saving of Gasolene

We guarantee to prove it or return your money

PRICE $5.00

Write for Our New 42 Page Catalog

The G.-L. ECONOMIZER COMPANY

1410 TIMES BLDG. NEW YORK, N. Y.

JAMES COGGESHALL, Room 22, Motor Mart Bldg., Boston, Mass., New England Representative

ROYAL CROWN AUTOMOBILE SOAP.

TRADE MARK

Best in the World for Washing Automobiles. No Garage should be without it.

Contains No Free Alkali. Positively Will Not Soften or in any way injure the varnish or dull the finish of the car.

Cars on which it is used retain the highest polish.

GENEROUS FREE SAMPLE

To any Dealer, Garage Owner or Car Owner, who will mention this publication. Write for it *now.*

WE ALSO MAKE

Royal Crown Metal Polish,

Best on the market. Get our interesting free literature.
Good Agents Wanted.

CROWN SOAP CO.

1947 West Fayette Street, Syracuse, N. Y.

"VELOS MAKE AND BREAK DISTRIBUTER"

The simplest and most economical igniter.

Used with one non-vibrator coil for any number of cylinders.

It will end your ignition troubles and save your batteries.

WRITE FOR CATALOG

PHILADELPHIA TIMER AND MACHINE CO.

326 Vine Street,
PHILADELPHIA, PA.

Automobile Dealer and Repairer

A PRACTICAL JOURNAL EXCLUSIVELY FOR THESE INTERESTS.

VOL. VI., No. 6. NEW YORK, FEBRUARY, 1909. PRICE { 10c. PER COPY $1.00 PER YEAR

A NEW GARAGE.

Conspicuous Example of the Quick Result of Effort and Enterprise.

The Clinton Automobile and Garage establishment at the corner of the Boulevard and Oak St., West Hoboken, N. J., is a conspicuous example of what can be accomplished in a short time in this business by enterprise and a practical knowledge of repair, storage, garage and supply requirements.

The building, which was completed and occupied only last July, is of concrete block construction with cement floors and is strictly fireproof. Its length is 142 feet and the width is 43 feet in front and 50 feet in the rear. In the basement at the rear, and easily reached at the side from the street, is a well-equipped repair shop, 25x50 feet. In the second story at the front are locker rooms for chauffeurs and a stock room for accessories. The main floor which is the garage proper occupies the entire length of the building and has a capacity for 50 cars. When the garage was visited by a representative of this magazine there were cars to the value of nearly $100,000 on the floor.

THE CLINTON GARAGE.

The company supplies its own light and power, and the electricity for battery charging, the large dynamo being in the repair shop in the rear. It is agent for the E. M. F. car which has so quickly sprung into popular favor as well for its undoubted merits as for the spirited advertising campaign which was made for it last fall. It will also supply any standard car wanted at the list price. With selling, storing, renting, repairing, vulcanizing, and selling gasoline and accessories, it may be imagined that the establishment is quite a busy one.

The personnel of the business is represented by Charles H. Simerson, president and general manager, Charles F. Gilman, master mechanician, A. F. Meng, chief demonstrator and John Gaess, demonstrator and repair man. Mr. Glimon, the head mechanic, frankly stated to the representative of this journal that he preferred it for practical usefulness to all other automobile publications.

STEAM OR GASOLINE.

Some Strong Statements of an Adherent to the Steam Car.

From D. Walter Harper, Pennsylvania.—The editorial in your January, 1909, issue under the caption, "Steam and Gasoline" has been brought to my notice. There are some things which I would like to take exception to. You say, for instance, "the gasoline car has an advantage of greater power for a given weight." As a matter of fact, the steam car for which I am sole agent in Philadelphia will undoubtedly prove upon thorough investigation to develop greater horsepower per weight than any other car in the world. Recently tests were made on the dynometer at the Automobile Club of America in New York. One of the best known gasoline cars rated at 40 horsepower showed with the rear wheels under certain given conditions 22 horsepower. This car weighed well over 3,000 pounds. Another car, a 30 horsepower, perhaps the best known American car, and certainly the most fashionable, developed 26 or 28. This car weighs about 4,000. A Stanley model H, 20 horsepower car, weighing about 1,600 pounds, was then run upon the dynometer and developed 50 horsepower. The conditions were just the same for the three tests except that the blower arrangement for the gasoline car was not adapted for the steam car, and therefore, the steam car was tested without a blower, and therefore without the same draught conditions that would exist in road work. In other words, the so-called 40 horsepower developed one horsepower for every 136 pounds in weight. The 36 horsepower car developed one horsepower for every 146 pounds in weight. The steamer developed one horsepower for every 80 pounds in weight. Furthermore, I am informed that the gasoline tests were made by the representatives of the manufacturers of the car and in their interest, while the steamer was a two-year-old car in the hands of a private owner and the test was made without the knowledge of any one interested in its manufacture.

You say further, "the gasoline car has the advantage of the smaller fuel consumption for equal power." No records were kept, so far as I know, of the gasoline consumed on these dynometer tests. While it is true some of the smaller gasoline cars of one to even four cylinders can make a few more miles to the gallon than the low powered steamers, this does not necessarily mean that the consumption is smaller for equal power. The average driver of a steam car does not stagger up a steep hill in the fashion of the average low powered gasoline car driver. Nor does he hesitate or go slowly on hard roads. His car is powerful enough to go over the hardest hill at a fast clip and pull through the hardest roads at a far greater speed than the gasoline car of equal price or rated horsepower. The extra hard work means higher horsepower developed and delivered to the rear wheels and this of course means a greater consumption of gasoline.

INTERIOR OF THE CLINTON GARAGE.

In other words, if the low powered gasoline car did as much work on the road as the low powered steamers it would use as much gasoline, and if the steamer went no faster and did no more work than the gasoline car it would probably consume no more gasoline.

You also say that the gasoline car is similar in construction. The most cursory examination of the steam car of the make which I represent would show you that it is far simpler than any gasoline car of equal efficiency. By equal efficiency I mean to say at least a four cylinder car. It might be possible to build a single cylinder car simpler in construction than my steamers, but I have never seen one, and certainly no single cylinder car can approach in efficiency the efficiency of the steamers.

Under the hood of the car which I represent is the burner and boiler, in other words, the generating plant. In all this part of the car there is not a single moving part. Under the floor are the water, gasoline and cylinder oil pumps, all actuated by one moving part, exclusive of the balls. The pumps are connected to the engine by two more moving parts, making three altogether so far. Then in the engine itself there are just 13 moving parts. There is no transmission. The en-

gine is geared directly to the differential on the rear axle. In this differential there are three bevel pinions and the main differential ring itself, making four moving parts. The axle consists of two shafts, and on the outside of each shaft there is a round taper section and a square section on which the rear wheels are forced, thus making them virtually a part of the driving shaft.

Thus to count up the moving parts in this car we find there are 3 for the pumps, 13 for the engine, 4 for the differential and 2 for the axle, including the rear wheels. A total of 22 moving parts. The ordinary gasoline car, certainly any car of equal efficiency, has more than 22 moving parts in its transmission alone and this steamer has no transmission at all. There are, to be sure, in addition to these 22 moving parts, two automatics, each one of which has a single moving part. But there is, on the other hand, an entire absence of magnetos, carburettors, commutators, distributors, vibrators, batteries, spark plugs, etc. Furthermore, there is only one throttle on this steam car. There is no gear shifting lever, no clutch, no chain, no driving shaft and no crank; and as to gasoline cars being more easily kept in order I would point out that the manufacturers of the car which I sell estimate that 95 per cent. of all they have ever built, including their largest touring cars, are cared for and driven by their owners without the assistance of hired chauffeurs.

As to accessibility the gasoline car is not in the least superior to the steam car which I represent. In fact, it is decidedly inferior to steam, in that there are more things that have to be gotten at. Funrthermore, in the matter of adjustment with all the various devices for ignition, carburetion, etc., the gasoline car is much more difficult to keep tuned up. Each one of these various devices must be adjusted properly as to itself and in harmony with every other one in order to get the highest efficiency. This is the reason a gasoline car a year or two old driven, without overhauling and adjusting, loses anywhere from ten to 50 per cent. of its power. My steam cars, on the other hand, when a year or two, are not subject to the lack of harmony in its various parts, because the parts are fewer in the first place and require less nicety of adjustment.

Your very clear explanation of the relation between the revolution per minutes and horsepower indicated, will be appreciated, I believe, by a great many laymen as this has been a subject of some mystery to the unenlightened.

I would point out, however, that one of our 20 horsepower touring cars, such as developed 50 horsepower on the dynometer tests referred to above, is equipped with 34-inch wheels, which make virtually 400 revolutions per mile. The car is geared 43 to 60, that is, the engine makes 60 revolutions to 43 of the rear wheels. Thus in going a mile a minute, the maximum speed allowed, so far as I know by any police authorities, the engine would make 645 revolutions. In travelling at a safer and ordinary rate of speed of 30 miles per hour the engine would therefore make 322½ revolutions per minute.

(Note by the Editor.—Space is given for the foregoing quite willingly, for if it is true, then too wide publicity cannot be given it, and steam cars have long suffered from public misapprehension. Moreover—still assuming that what is stated above is true—this erroneous public opinion is entiely due to the manufacturers themselves of steam cars, but it is time they awoke. Either the better of the steam cars are superior to the gasoline cars, or they are not. If they are better, then the public is making a great mistake in buying but one of them to ten gasoline cars; if they are not better, then our friend above is not making strictly accurate statements.)

He Prefers the Steam Car.

From H. N. Gray, Vermont.—In an article from G. C. Glover, New Richmond, Wis., I take exceptions to every statement he makes but two. I ran a model F Buick, 22 h.p. during the season of '07. This is in my judgment one of the best medium priced cars for this hilly country.

I would refer first to climbing, which this article treats so much on. Few hills in Vermont can be made on high gear. Watch the average driver of a gasoline car on his approach to a hill (I do not mean 40 and 60 h.p. cars, for they are not plenty in this section). See him begin to open and get all the speed he can. He goes up a short distance and speed begins to drop. He shifts to second gear, then to slow. He meets a team and has to stop. The chances are he gets out and cranks up. He lets his engine get up to as high a speed as he dare, and then pulls on the slow speed. Things start with a jerk if they start at all.

Enough of this. Every automobile man who runs a car knows all about it, and so much for the trouble on the hills. On the other hand the gasoline car is much less trouble and care in the garage, can be got out in the morning much quicker and has many advantages in that way over the steamer.

But I want to say a little about the advantages of the steamer. I have a model M 30 h.p. Stanley car to carry seven passengers. I have run it 5,000 miles this season, and I do not find a single trouble. I ran this car with five passengers from Boston, Mass., to Westbury, Vt., in the first part of June, 223 miles, in nine hours and fifty minutes, including all stops for supplies, etc. This at a season of the year when the hard roads and long hills through New Hampshire were under repairs. I have repeatedly made long runs and never with less than five passengers, covering long hard hills, and in some cases steep hills more than a mile in length, and never had a stop or slow down either for steam or water. I carry 500 pounds of steam, and have yet to run up against a hill, or deep mud when my steam would drop over 30 pounds. Hill climbing is the very strongest argument in favor of the steam car, and was all that ever induced me to change from a gasoline car. Take, for instance, a steep, hard, long hill. It is not necessary to get up speed to start with, but on the contrary they have the ability to start from a standstill on the steepest hill and gain speed all the way up.

I have found the running of a steamer much pleasanter, less care, more surety of going and getting back on the road than a gasoline car. I can steam up and get my car ready to start in fifteen minutes any day, and with pilot light left burning will be ready any time during the day without attention.

Now as to repair bills. I had my gasoline car overhauled and put into good running condition by an expert from the factory at the end of the season of 1907. I paid $175. I have had my steam car back to the factory, that is, engine and all parts that show any wear at all, and it is back in my garage at a cost of $56.56, and is as good as new for next season's run. My gasoline car gave me about 10 miles to the gallon,

my steamer about 7, and sometimes 8, according to road conditions.

I know of a Stanley steamer, 10 h.p., that has been owned in this town for seven years, and practically nothing was paid out on it for the first five years. I know of more than twenty-five in this near vicinity, and you never see them stalled or laid up on the roadside. They have the ability and staying qualities to go and get back on their own power.

Just two items in this article referred to I am willing to concede. The steam car takes more fuel and a little longer to get started, but not as long to get there, where there are hills to climb.

He Favors Gasoline Cars.

From George Kiltz, Illinois.—I see several articles published about steam and gasoline automobiles. Well, I have run a steam auto for one year. It was built by the Foster Wagon Co., of New York, but I remodeled it. I put in a new boiler and a new Walker burner, all the new improvements I could get, so as to make it an up-to-date car. It ran very nicely. I knew just how much gasoline it took to run a mile. It was a little runabout, but it took lots of gasoline. I doubt very much if I could go ten miles on one gallon. I am a man not easily excited, but when the year was up my nerves were badly unstrung. It was a constant strain on my nerves to watch the different parts, such as steam gauge, air gauge, water glass, and their clogging, and not knowing where the water was, and the pressure pump and the joints. Although I had taken the best of care to make them tight, after running a while on rough roads, they would begin to leak, and the throttle would cut so badly in a short time that it would not hold steam and the burner and pilot would go out in spite of all the care I could give them.

I have run down hill when I did not need much steam, and the steam would rise, so as to put the main burner out, and when I would climb the hill, it took the steam. I would run short of steam and find out that the pilot had gone out, and the main burner being hot would fill the whole generator with gas, and then when I would start the pilot there would be a terrific explosion. I did not let the pilot clog from neglect, as one writer has said, and I have had the main burner clog so badly that I could not get steam enough to run. Then great heat accumulates from so large a burner.

Those who would like to try their hand on a steamer can, but as for me, I am done with it. Every word I have said about steam is true, and only too true. With the experience I have had with it I would not accept one as a gift, and I to run it. I can make most every part of one, and I guess every part.

I now have a Rambler runabout, and since I have had it my nerves have got back to their normal condition again. The consumption of fuel is very light, about twenty miles for a gallon.

My idea about a gasoline car is the friction drive is bad. I see in it the way a car can be run either slow or fast, rough or smooth. A gasoline engine must not be throttled too low. The power is much better when the engine is running at a good speed, and in the friction drive this can be done.

Three automobiles have been lost within a year by Frank P. Moshier, of Greenwich, Conn., each being burned as the result of an accident.

A Car Table.

The use of the table shown in the illustrations is two-fold. In the first place it makes a convenient table for luncheons at the roadside, and in the second place it keeps the occupants of the back seat delightfully warm, as it prevents the down draught over the back of the front seats which is so chilling to the occupants of the rear of the car and especially to their feet. In the old days the table was a fixture because the entrance was at the back, but in these days of side

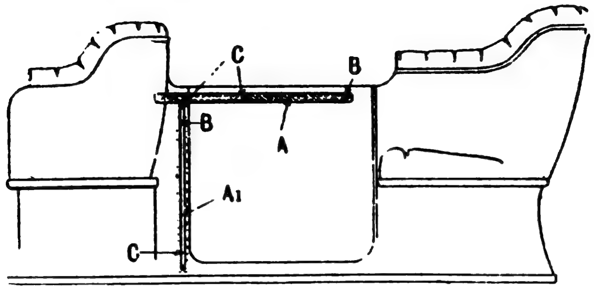


Fig. 1—Combined table and shield in section.

entrance bodies it is necessary that the table should quickly collapse flat up against the back of the front seats.

There are many simple methods of effecting this, but the illustration shows a good one. Fig. 2 shows the table in the act of being drawn up from the closed to the opened out position, and the smaller shows it when extended for use either as a table or as a wind shield. It is a great comfort on cars which have a rather long space between the front and the back seats, as these are notoriously cold, and there is so much wind playing about the feet that it is difficult to even keep the rugs in position when they are aroused as

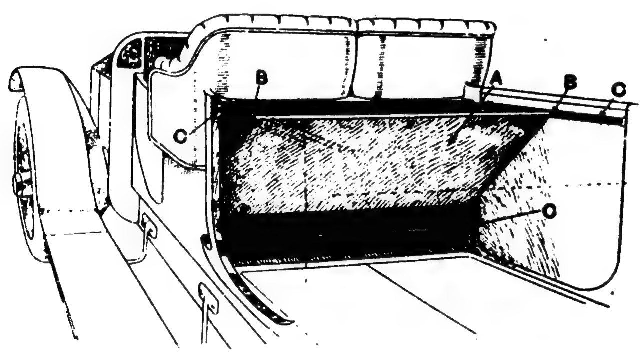


Fig. 2—Collapsible table and wind shield for back seats.

they must be in cool weather. With this wind shield this difficulty is entirely overcome and the back of the car made quite cosy. Its uses as a table are too obvious to need enumeration. To be satisfactory it should be well made otherwise it will rattle and not work easily. When properly made it can be pushed out of the way for getting out of the car as easily and as quickly as one would throw aside a rug, but unless really well made it may cause annoyance in rattling over rough roads. In Fig. 1, A shows the shield in position, B, the guide pegs, A1, the shield out of use, C, the grooves for guide pegs.

In Fig. 2, A is the table or shield, B, the guide or supporting pegs, C, grooves in which pegs B run.

Many users of cars do not give any attention to the character and evenness of the exhaust, but from it can be determined, to a certain extent, the uniformity of the timing is correct.

THE KNIGHT ENGINE.

A Test That Showed Some Remarkably Effective and Unusual Qualities.

The Knight engine which was invented by a Chicago man and which has been adopted by the famous Daimler car manufacturers in England, has created no end of discussion there, and it must be admitted that the balance of opinion is favorable to this new idea engine. The following account of actual experience with the car, Mr. Knight himself being a passenger, will be read with interest:

The car was one of the new 38 h.p., new out of the shops, and had never seen the road before. It was only a chassis with a shop body, but it gave comfortable seating for three passengers, and luggage. Mr. Knight took the wheel, and almost too late came a warning from the mechanic that the clutch was extra fierce. However, nothing very dreadful could have happened at the worst, as the motor takes up its load at very slow speeds, and this we found later was but one of its charms, so we got away with the least suspicion of jerk. This was, be it remembered, a totally untested chassis, and such an experience would not fall to the lot of the ordinary car user, for it is with the purpose of correctly adjusting and putting things into perfect working order that cars are given thorough road tests.

The road traversed was villainously bumpy in some places, all awash in others, and abnominably greasy in between; yet we travelled wonderfully comfortably until the cold began to tell. A keen nor'-easter was blowing, and so penetrating was it that any attempt to open up the throttle fully when circumstances permitted had to be very quickly abandoned. There was no joy in conversation, even with so interesting a companion as Mr. Knight; the bitter cold froze one's words before they could be uttered. But even the ve rbal constraint was, perhaps, an advantage, for it served but to accentuate the silence of the engine, for conversation was all sufficient to make one lose consciousness by the hum of the motor. And so the miles slipped by. Mr. Knight was disconsolate by the absence of hills. "Are you cold?" queried he. "Rather," was my reply. "So am I, but I would go four miles out of my road to find a hill." But I held my peace as firmly as though I had known every hill within a twenty-mile radius of Nottingham.

The next day we took the road early for the return journey. A thick fog prevailed, and the cold was more bitingly bitter than on the preceding day, but it was with a comfortable feeling that I took the wheel after a brief run over the control levers to satisfy myself that each one's mission was thoroughly understood, for car controls vary. "Start on second," said Mr. Knight, "you seldom want first," so in went the second speed, and we glided off into the fog and Nottingham traffic. A few yards on second sufficed, and in went the fourth, missing the third altogether. On fourth we crawled, for one could scarce see three cars' length ahead, and the fog increased in density as we neared the Trent, and became so bad that just over the bridge we lost ourselves by bearing up for our road too early, but it was soon found again after a bit of reverse gear work. With Nottingham behind I opened up the throttle slightly, and then began to learn things. And the first was this: With the slide valve engine and a three-jet carburetter one can get a gradual acceleration, slow but sure. The second discovery was that a very rapid acceleration was produced by advancing the spark, whilst the opening of the throttle was an operation to be performed warily when one can see something less than the distance between one telegraph pole and another ahead. The flexibility and range of control are really wonderful.

Once in meeting traffic the clutch was taken out and the brake applied, during which time the motor had a fairly advanced spark and the throttle was about one-quarter to a third open, yet it was not until a quiet voice at my side said, "Say, you're racing the motor," that I realised what had been done. And so we drove on, ever straining to see through the fog which enveloped us. The car slows a bit, so the throttle is opened up to the second of the three jets, and speed is picked up again and increased. It is bitingly cold, but the fog thins slightly, so we let the car keep going, until, running up what feels to be a little hill, it is checked as a horse-drawn vehicle comes out of the fog. It is passed, the throttle opens again, but only for a second or two, as the speed, although slow, is getting rather beyond the range of vision, so the throttle is backed a little. Even though we are on a 38 h.p. nominal, and we know it pulls 55 h.p. on the brake continuously, it is still surprising that we should have ascended a gradient we knew to be over half a mile long, fairly stiff, and culminating in a lift of about one in nine, without knowing it.

In traffic driving I found it an advantage to switch on the accumulator ignition, as the engine would run still more slowly and smoothly on top gear than with the magneto ignition alone. Though I had never driven the car before, it was unnecessary to use the first speed at all, as the car was started on several occasions on second speed and once on top, and then not under ideal conditions.

The Question of Bearings.

As to the use of ball or roller bearings, Charles E. Duryea well says that both must be well made to be long lived, and it has not been many decades since factories were fitted to turn out such work at prices within reach of the buyers, so the motor vehicle has caused a great forward step in mechanical progress by demanding the best and commanding prices sufficient to permit makers supplying the demand.

If one ball or roller is slightly irregular or slightly larger than the others, it must take all the strain and not only receive damage itself, but very likely damage the surfaces on which it rolls. This is why such bearings are all right if they are right, and are all wrong if every part thereof is not right. Admitting this perfect workmanship, the question stil remains as to which is the better ball or roller and whether these are to be preferred to the older form of plain, bronze or babbit bearings, with which the world is better acquainted.

On this point designers differ, and each is guided in his selection by the nature of his service by the conditions surrounding the bearings, by the probable care or lack of care it will receive, the ease or difficulty of lubrication, and largely by the speed of the moving part. General bearings designed for high speed and free from shock are of the ball variety, while bearings intended for heavy loads and yower speeds are more usually fitted with rollers, eaving the plain bearings for places where the strain is intermittent or in the nature of shocks such as are received by the bearings of an internal combustion engine.

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A Magazine of condensed and compact information for busy readers.

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ADVERTISING RATES MADE KNOWN ON APPLICATION

NEW YORK, FEBRUARY, 1909.

Missing Numbers—Our readers are requested to remember that it always gives us pleasure to re-send numbers which have gone astray in the mails.

DON'T GET OUT; GET IN.

From A. B. Richmond, Michigan.—Your leading editorial, "The Retail Dealer," in the current number of your paper is one of the most truthful things ever written, but it is not one-half as comprehensive and drastic as it ought to be to awaken the sleeping manufacturers to a realization of what is necessary to be done to promote the life of the dealer.

I have been engaged in the retail business over five years, and have realized for a long time that there is no money in the retail business for any man of ability, for the same efforts applied in other lines will bring him much better returns.

Your deductions are so in accord with my ideas that I could not refrain from writing you a commendatory letter, and to tell you that for the reasons you set forth, I am getting out of the business.

The foregoing feeling, so plainly expressed, is by no means an isolated one. It exists to a greater or less extent wherever cars or accessories are sold, and it is chiefly due to the short-sighted policy of some of the manufacturers from which there is no escape except by concerted action. And if a business not yet out of its swaddling clothes is thus demoralized, in what condition is it likely to be when it becomes fully matured?

We recall one case where a dealer in a good sized city sold twelve cars last year and the first year of his experience in that line. He informed us that he "just about came out even." That is to say, he did a business of at least $12,000, and his expenses in selling just about balanced his income. He says he expects to do better next year, but he will be lucky if he even does as well. The chances are that his territory may be invaded, there may be bad debts, the catalogue house will loom up, and the "factory to user" manufacturer will be bombarding his prospective customers with literature that claims better values and lower prices than ever before.

So that instead of business getting better, as he expects and as it should—for few dealers made any money the first year they were in business, nor did they expect to or grumble when they did not—it is getting worse.

Meantime the forces of production in almost all avenues of trade are either working under iron-clad rules or a so-called "gentleman's agreement," while the forces of distribution are pursuing a policy of "everyone for himself and the devil take the hindmost."

Is it any wonder, then, that the individual dealer is unable to do business at a profit or in a business-like way?

But if the dealers were organized as is the case with so many other retail associations, it would be far easier to sell goods at a profit based on the cost of the goods and the expense of handling them than it is to do business now at no profit whatever.

We trust that Mr. Richmond will not get out of the automobile business but get into it deeper. The trade needs just the kind of man that he seems to be, and if there were but one dealer in every country that feels just as he does, the National Retail Dealers' Association might soon be a power that would stand for justice, for legitimate methods, and for the public welfare. And this is what any business stands for that is done at a profit and conforms to principle and common sense.

THE DEALER HAS NOTHING TO SAY.

One of the more exasperating grievances of the retail car dealers begins at the very outset of their taking an agency for a car. In many instances, the car which is demonstrated for the prospective agent at the factory or manufacturer's sale station has been specially "tuned up" by expert mechanics until it runs with the smoothness and perfection of a Jules Jurgensen watch, and naturally the dealer is captivated with it.

When it comes to a sale, the dealer is required to pay 20 per cent. down in cash and the balance on delivery. He is then obliged to sign a contract which compels him to pay the balance on delivery or forfeit the payment already made. This would not be so unfair except that a clause is made in the contract protecting the manufacturer from delivery at the period stated in case some "act of Providence" or "labor trouble" could ensue, and as a result the car is delivered whenever it suits the convenience of the maker and quite likely long after the period stated in the contract.

In one instance a car which was promised Dec. 15 was not delivered until Feb. 4. Possibly in a suit for breach of contract on the ground that no "act of Providence or labor trouble" or what-not had interfered, the dealer might have won his case, but life is too short and litigation too uncertain for such a step, so the dealer takes his car.

Meantime, the prospective customer has very likely bought a car of some other make or decided after waiting that he will defer purchasing until another time. Then the dealer finds this stock car just out of the factory a different running car than the one which was demonstrated to him and which had been keyed up to the highest state of perfection.

But he has the car on his hands and he must sell it, so he looks for another customer. And even if he finds some one who may purchase, his trouble and expense have hardly begun. The man who is looking for a car must of course have a demonstration, and in some cases he would like the demonstration whether he really has any idea of buying a car or not. He gets a nice free ride, you know, and it gives him a chance

to compare this car with some other one which he has tried so that in case he ever should decide to get a car he will know which is the better.

So the dealer puts in ten gallons or such a matter of gasoline and a quart of oil, and delegates his demonstrator whom he pays the highest wages, to take the car out. But no ordinary road test will answer. The car must be run up hill and down dale—the highest and steepest in the vicinity—and made to perform all manner of "stunts" that can be devised. The demonstration takes about all the afternoon, the prospective customer is delighted, and—that is the end of it. A few demonstrations of that kind and the dealer has a second-hand car on his hands.

The moral of all his is quite obvious. It shows that the dealer takes all the chances, bears all the expenses, suffers all the loss, and while he is responsible to both the purchaser and the manufacturer, neither is responsible to him. And in a transaction where one party has nothing to say as to what he shall pay for a thing or when he will get the goods, and nothing to say as to what he shall sell for and little to say as to the conditions of such sale, the first rudiments of a fair business transaction are lost.

HOME AND FOREIGN CARS.

Let us be fair with ourselves and with others. On the one hand we hear claims made in certain quarters that home cars are better than those of foreign make. It is maintained that the material used and the way it is put together, produce a better car than is made in either France, England, Italy or Germany, and that taking the good and bad together the average quality is higher in this country than in Europe.

Now the less we hear of this kind of talk, the better. Automobile manufacturers in this country were the first to raise their voices when there was talk of reducing the import duty. They had a right to protest against this duty reduction, and the present rate of duty should be maintained. But it will be a little difficult for those who are not practically interested in the business to understand how if American cars are better, there should be a necessity for protection. In point of fact there are specific advantages in both American and foreign cars. But taking the average condition, the foreigner can produce a better car for the same money, than can be produced in this country. This is not due to their superior mechanical or business ability, but to the fact that the wages of expert and ordinary labor is less in Europe than it is in America.

WHEEL REVOLUTIONS.

Under the heading, "Making the Meter Lie," an esteemed and usually accurate contemporary, in discussing taxicab charges and the working of the meter, says:

"Say for instance, the wheels on the cab you hire have, with tire blown up, an extreme diameter of three feet. Well, each of those wheels has a circumference than of about 9.4 feet, and in covering a mile, each wheel would make very nearly 562 complete revolutions. Suppose, then, that before starting, the driver, unknown to you, lets down one inch all the way around the tire of the wheel to which the taximeter registering device is attached. He has reduced the circumference of that wheel to 6.6 feet. You do not notice anything wrong, and the trip is begun. Now it stands to reason that the wheel of the smallest circumference must make the greatest number of revolutions, and so it does. Figure it out for yourself. While the other three wheels are only making 562 revolutions in covering a mile, the wheel with the slack tire is making 800 revolutions covering the same distance, and although the whole cab has actually covered only one mile, inasmuch as the wheel of the small circumference is the registering wheel, nearly a quarter mile has been recorded against you."

As the foregoing statement is likely to be copied more or less without verification, it should be stated that the reduction of the circumference of the wheel by deflating the tire an inch would increase the revolutions in a mile, in round numbers, from 562 to 594 only, rather than to 800, which is quite another thing, but a swindle, nevertheless.

Speaking of the size of wheels and wheel revolutions, while a wheel two feet in diameter makes twice the revolutions in going a certain distance that are made by a wheel four feet in diameter, yet the larger wheel must be far more than twice the weight of the smaller one to give the same amount of strength and service.

FRIENDLY CONTRIBUTORS.

It is gratifying to note that so many of our friendly readers are sending us the results of their experience in selling, running, repairing, and storing cars. But like poor Oliver Twist, we are constrained to ask for more. And we do this with all the more confidence because it is a reasonable and moderate request, and like the well-known scriptural bread cast upon the waters—it returns after many days in much larger proportion than was given.

If, we will say, one hundred readers send in something giving information from their experience and observation, each will get back ninety-nine times more than he gave—provided our arithmetic is not at fault. Moreover, the free will offering articles of the fraternity of car dealers and users are of far more value and interest than the best that the editor or the scientific theorist can do, no matter if he is as wise as Solomon.

We like these articles that are sent into us by our readers. They are "human documents," as some of the literati would say. They are vital; they have an unconventional swing about them that the "pot boilers" and the studied work of the scientific writers cannot approach.

Gentlemen, we are grateful to you for your friendly interest, and in behalf of many thousands of other readers, we shall be glad to hear from you as often as you have opportunity.

SIX CYLINDERS AND LESS.

The chief advantage of the six cylinder car is its smooth running or lack of vibration and the ease with which it may be throttled down to a low speed. Its disadvantages are the increased number of parts and its greater consumption of gasoline for a given amount of power.

The increased flexibility of the six cylinder is due to its more constant exerted force. This constant torque permits the motor to be throttled very low if need be, and it is possible to drive a car slowly in the crowded streets or to change to high speed without changing gears. For use on crowded city streets this quality appeals to the experienced driver. In hill climbing it is not necessary to race at the bottom of the hill in order to reach the top before changing gears.

On the other hand, the most popular and widely

used car in this country to-day is a single cylinder, and for the average owner or driver the four cylinder car will on the whole give the greatest satisfaction.

A DRASTIC CURE.

Will nothing but death cure the American people of their reckless speed mania?

That it will soon ruin the most perfect car that can be built seems no bar to it. That speed and speed alone is what causes the destruction of highways does not mitigate it in the least. That it endangers every other user of the highways seems no deterrent. That going through the highways as if one were shot out of a gun forbids all rational enjoyment of riding seems to be entirely forgotten.

Indeed, all else seems subordinate to the craze to "get there at once." And yet, reduced to its final analysis, every accident that occurs is caused by undue speed. "But," says some one, "you don't mean to say that I was going too fast when that man dodged in front of my car and I ran over him? Why, I wasn't going more than eight miles an hour." We do say so, decidedly—at that time and in that place. For if you had not been going so fast you would have had no accident. Too high speed is a relative matter and no legal mandate can fix a speed that is always absolutely safe except that it be, "No car shall be driven at a speed that endangers other users of the highway or street."

And will some one please rise and explain what advantage it is to have a car that will go fifty miles an hour, when it is not only unlawful but courting death to drive a car at anywhere near that speed upon any public highway?

OUR MISTAKES.

Now and then we make mistakes. And considering the fact that we are chiefly engaged in preventing them, it is no wonder that they occasionally creep in, sometimes from one cause and sometimes from another, but always from an unexpected one.

Being human, we cannot promise to eliminate all mistakes, but our readers have the right to expect that prudence, vigilance and effort be used unsparingly to prevent them.

It is far more culpable to try to sneak out of a mistake by placing the blame on some one else than it is to make it. For human foresight may not prevent the one, but honor and honesty will forbid the other.

If our readers see any statement of fact, mechanical or otherwise, that they know to be incorrect, we shall consider it a friendly favor if our attention is called to it.

Meantime, there may be a slight satisfaction in knowing that we learn wisdom from mistakes and often discover what will do by finding out what will not do.

MERELY "GRAFT."

A matter that needs correction in the retail trade is the practice of giving a commission to every Tom, Dick, or Harry who can control a little business, or who pretends to do so. If a supply house sells a set of tires to a chauffeur acting for his employer, a present is expected, and on every repair that is made there must be "something in it" for the alleged power that turns the work in that direction.

The whole pernicious business ought to die the death of a dog. It is unbusinesslike; it is a form of dishonesty; it brings a legitimate industry—not a "game," by the way—into disrepute.

Moreover, it is easy enough to stop it. Let dealers in every town or city get together and enter into an agreement to do nothing of the sort. It might not be so easy to enter into a compact to be dishonest for no honest man will entertain such an idea, but a compact to be upright should go easily and be kept with merely a word.

AT A LOW COST.

The cost of an automobile need not deter anyone from owning one who can afford the cheapest kind of a horse drawing vehicle. The cheapest car at the exhibition in Madison Square Garden, New York, cost $350. It was fitted with a body finished in natural wood, and had a carmine running gear. It had the friction drive, and of course was as simple as possible, but it was difficult to see how it could be sold for that price. It was not of the so-called buggy pattern, but had twenty-six inch wheels and pneumatic tires. It is worth about twice as much as it sells for, and, as for that matter, so is almost any of the low cost cars.

LESSONS FOR DRIVERS.

Carelessness and Ignorance Responsible for Most Accidents.

The number of accidents this month is not a long one, and many of those reported are due to carelessness in passing street cars that have stopped at crossings or elsewhere for the purpose of taking on passengers or letting them off. As more accidents of this kind have occurred during the past three months than from any other cause, it would seem as if there should be a special warning to prevent their frequent recurrence in the future.

In Syracuse, New York, the president of an automobile club has received a communication from the district attorney, asking his co-operation in the suppression of what he terms "brutal and inhuman action of motorists." He cites three cases of death in that city and vicinity during the past sixteen months, where in each case the driver and occupants of the car succeeded in speeding away without being identified. The district attorney asked the assistance of the club in trying to identify such unscrupulous persons. As has been stated in these columns before, the license number gives the public little protection in cases of this kind, and some new method must be devised to apprehend those who are guilty of manslaughter. At any event, when such individuals are apprehended, after having tried to escape, penalty should be far more severe than if they had remained and held themselves responsible to the law.

It is noticeable that in many cases chauffeurs look upon conviction of violating speed laws as something of a joke. Probably this feeling is somewhat intensified by the attempts at witticism, which reporters often make in writing up matters of this kind in the daily press. It would hardly seem as if anyone would care to be branded as a criminal, and it is sometimes of great value to a person to be able to state that he has never been convicted of crime. In case, for instance, a man should be put on the witness stand to testify in a civil suit, it would be rather embarrassing if he were asked if he had ever been convicted of a crime, and if he were obliged to reply in the affirmative it would impeach his testimony as a witness. It

is the ambition of every decent citizen to have a clean and clear record, if possible, and to violate the automobile law is as much of a crime as to violate any other statute.

The following accidents are only given as examples of many others. No attempt is made, or ever has been made, to give long records of these accidents, the purpose rather being to give such as would serve as a lesson to others.

The Same Old Story.—In Chicago a young woman, while alighting from a trolley car, was struck by an automobile, receiving injuries which caused her death in a few hours. The chauffeur put on speed and tried to run away. He was finally halted, however, when he found himself looking into the barrel of a loaded revolver held by a policeman.

Another "Joy" Ride Accident.—We do not like the term "joy ride." It is another way of expressing the phrase "criminal ride," and there is a meaning to the word "joy" that is altogether objectionable in such connection. In Philadelphia the other day two brothers were peacefully strolling along when an automobile rushed upon them with terrific speed. One brother was tossed twenty feet into the air, and came down in the path of the machine, breaking his leg and fracturing his skull. He will die. The other was seriously injured. When the occupants of the car saw what havoc they had created they fled, although several bystanders tried to hold them.

Fell Through a Bridge.—Near Allentown, Pa., a heavily loaded auto truck, while crossing an old wooden bridge, built many years ago, went down into the river below with a terrific crash. The third occupant of the truck was saved. It should not be forgotten that a heavy auto truck, well loaded, is more than twice the weight of any horse drawn vehicle.

Steering Gear Did Not Work.—While driving near Marietta, Ga., an automobile was thrown into a deep ditch, because the steering gear refused to work. Five persons were seriously injured, and the car was completely wrecked. Quite likely an examination of the steering gear two minutes before the car started would have avoided the disaster.

In a Blinding Storm.—During a severe snow storm an automobile, driven by a woman, struck a department store delivery wagon, and the driver of the wagon sustained injuries which caused his death. The four woman occupants of the car are now under the care of physicians. The woman who was driving the car says it was going at a slow speed, but the snow storm was blinding. It is well to remember that in driving a horse, the animal usually exercises a little intelligence in a severe storm, because he can see. It is not so with the automobile; it goes where it is sent.

Clergyman Run Down and Badly Hurt.—Rev. H. S. Brown of Darien, Conn., while riding a bicycle and trying to avoid a horse-driven team, was run down by an automobile and had a leg broken and possibly internal injuries. The car was going rather slow but the driver claims he could not see the victim until too late to avoid him.

An Old Oft Told Story.—In Chicago a young woman who was about to step from a street car was hit by a taxicab and fatally injured, dying a few hours after. The cab driver at first escaped but he was afterwards arrested.

Here Is a Similar One.—While alighting from a car in Hartford, Conn., a young woman was struck by an automobile and injured so that she died soon after. The chauffeur was arrested, charged with manslaughter, and bail was fixed at $1,000.

Result of Careless Gaiety.—In Brooklyn, N. Y., six were injured in an automobile wreck while whirling round a corner at a speed estimated to be 50 miles an hour. There were three women in the gay party and all seemed able to get away without disclosing their identity, although seme were badly hurt. Just before the accident a policeman warned the driver of the reckless running, but he was laughed at by one of the young women.

Still Another Victim When Leaving a Trolley.—A young and pretty woman was killed by a taxicab on Broadway, New York, while leaving a street car. She went under the wheels of the taxicab and her body was dragged 20 feet. Of course in all such cases, the only party to blame is the driver of the automobile. But a few more arrests for manslaughter and fairly long terms of imprisonment will possibly reduce this sort of recklessness and awaken the chauffeur to the fact that some one is likely to alight from a trolley car at any time when it is standing at a crossing or elsewhere.

Clashes with the Lamp Post.—In Chicago, Ill., an unlicensed and untutored chauffeur tried to pilot a big car through the street. He succeeded for a time, but finally touched the wrong lever, as he says, and the car went crash into a lamp post and was pretty well wrecked. The moral of this is, that if one is not an expert car driver it is a good plan to learn in the solitude of the country.

A Peculiar Accident.—A prominent physician stepped into his car, but in some way a lever flew back, hit his arm and broke one of the bones into splinters. Just how an accident of this kind could have occurred, it is difficult to say, but that it did occur is without question

Head On Collision.—In Chattanooga, Tenn., two automobiles came together in the blinding light of a street car, and the occupants of both were thrown out. Their injuries were painful but not serious.The cars were much damaged. The two chauffeurs claim that the collision was unavoidable in the blinding light, but a little slower speed might have had a different result.

The Result of a Bursting Tire.—In St. Louis, Mo., the bursting of a tire caused a car to run wild. A lad of 11 years was just crossing the street, and he was run down, fracturing his skull so that he will probably not live. The chauffeur drove rapidly away and at last accounts the police were unable to locate him, although strenuous efforts are being made to do so.

A Skidding Car.—While driving at a rapid speed near Philadelphia the tire burst on a car. It skidded, ran into a tree, and a woman was thrown out and her skull crushed.

At 30 Miles an Hour in the City.—While driving at 30 miles an hour in New York City a big touring car bore down on a boy. It struck him and threw him far to one side. The driver of the car, probably thinking the lad had been killed, put on speed and escaped.

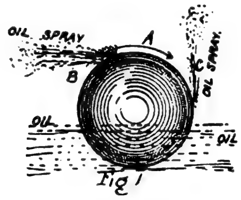
Removing Tar Stains.

If a tar stain is to be removed at all it must be done while the tar is fresh. It is not even safe to wait till reaching home, but after driving over freshly sprayed tar the car should be stopped for cleaning at the next village encountered. Butter is the best solvent for removing tar from the coachwork, while for cleansing the hood or personal clothing cotton wool dipped in gasoline is as good as anything.

BALL BEARINGS.

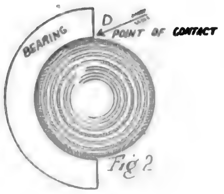
How Their Construction and Condition May Affect Lubrication.

The construction of the ball-bearing of the automobile of the present day does not differ very materially from the patterns of some years ago. There are the same balls, cones and caps. The adjustment is prac-

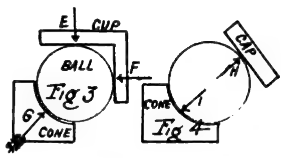


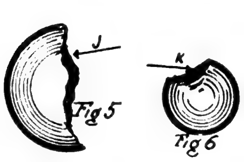
tically the same. Nevertheless, with the rapid changes in speed and facilities of the up-to-date motor vehicle, we find that there are points of detail requiring special attention. The increased speed put on bearings at the present time is one of the controlling factors. Hence we find indications of premature wear in balls and in the bearings. The greater number of vibrations per minute, the severe test of the lubrication, and kindred elements enter into the subject.

Supposing that there were such a thing as a ball revolving in space. Or better still, in a volume of oil, as illustrated in Fig. 1. There are no contracting sides, like cups or cones. The ball is turned on its axis. Oil films are collected and oil films are thrown off at B and C by the centrifugal force. The direction



turned is indicated by the arrow A. Of course there is a bearing in actual service, and this is shown in Fig. 2. The bearing produces a scraping surface. There is a point of contact with the moving surfaces as at D. If the contracting surfaces are smooth, if the adjustment is correct and the corresponding boxes arranged as they should be, the oil films will have an opportunity to form between the grinding surfaces and prevent frictional heating and wearing. The trouble is that the parts often get shifted, and unless watched carefully, we are likely to have a hot, groaning, creaking and wearing bearing. The first thing the automobilist

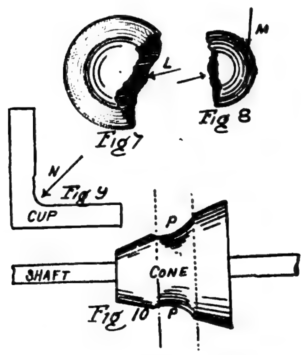




knows is that his machine is in the shop for an overhauling. I have found cases in which the bearings bind so tightly that the oil films have no opportunity to form. They are squeezed out. Heating and grinding result.

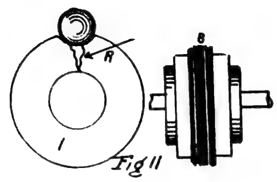
Then again a large space will be found in the boxes. This space does not bother very much until it begins to clog with gummy oil. Then there is trouble. The trouble increased until you locate the defect and overhaul and clean the parts. Here is where many automobile journals fail. There is a chance for foreign stuffs to collect and through carelessness, the material is permitted to remain until something happens. Then, oftentimes, instead of simply cleaning out the parts, the mechanical construction is tinkered with and nine times out of ten put out of businenss and an expert is called for. In Fig. 3 we exhibit a three point bearing, in which the points of frictional contact are designated by the arrows at E, F and G. In Fig. 4 is the notable two-point contact bearing in which the touching points are designated at H and I.

It is a good plan to closely examine the bearing be-



fore you begin to change it, and possibly find it is a two point or a three point of contact. While the problem of lubrication is the same in each case, there are other factors intervening. Broken and cracked balls operate differently in the two kinds of bearings. While the one style of bearing might carry around the broken ball shown in Fig. 5, it might not carry the worn ball shown in Fig. 6. In the former, the ball is broken off at J, and a rough side is made. In the latter the ball is worn by usage at K.

Still another type of fracture is exhibited at L, Fig. 7. Fig. 8 designates a ball with a broken side and with a crinkled surface at M. These crinkled surfaces

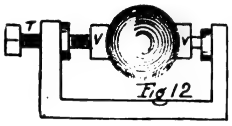


are traced to corrosion in balls which have been left to the inroads of rust in most places. There is no use trying to do anything with the bearing if there is a cracked, worn, broken or crinkled ball in the series. In overhauling bearings for cleaning and complete lubrications, it is a wise plan to carefully examine the steel balls one by one and restore all suspected balls with new and perfect ones. I would also examine the cups quite thoroughly and see if some of them are grooved as at N, Fig. 9. You would be surprised if you were to examine a number of bearings at the number of cases of grooved cups. Then again there are grooved cones as at P, Fig. 10, to mar the effect of the oiling of ball bearings. The best grades of lubricating oil in the market cannot thoroughly lubricate bearings grooved as in these cases.

You can refit and patch and drown the parts in oil. All this will accomplish but little good unless you substitute at least the worst worn pieces with new ones. In fact, it is wisdom and less costly in the end to put

in complete new bearing sets when one of the pieces is badly worn, for the reason that each part in the modern ball bearing is usually made and fitted to go with its own combination.

In Fig. 11 is a cracked cone, drawn from a case which was noticed lately. The lubrication of the bearing failed to be beneficial. Something was wrong. The bearing creaked and heated. It also rattled. Upon taking the bearing apart, it was seen that the shoulder of the cone was opened as at R. A ball would catch there and make the other scrape along and create unnecessary friction, noise and heating. It did not take long to right matters with a new cone. You can save some balls and cones, also cups, by grinding on the emery wheel and smoothing down on a buffing cylinder. A good form of cylinder is exhibited in Fig. 11. There are two side flanges which screw together on the shaft with bolts. Between the flanges are the disks of emery cloths. The wheel is properly



mounted and when revolved presents a good smoothing surface. Fig. 12 is a form for holding a ball. A wrought iron frame is constructed of convenient size and the uprights are bored for the threaded shaft. There are oval pieces V, V, to grip the ball.

In this way the ball can be handled while securely held. It can be supported against a revolving cylinder for grinding.

ATTENTION TO SPRINGS.

How They Should Be Treated When They Rust and Squeak.

Many cars squeak distressingly on rough roads, and the owners are often puzzled, as they know that all the spring pins are properly lubricated. What they do not seem to recognize is that the majority of cars have springs which from time to time require lubrication between the plates or leaves of which they are composed. If you have a car which squeaks mysteriously, first of all satisfy yourself that it is not what, for want of a better term, we may call a mechanical squeak. That is, assure yourself it is not caused by, say, an unlubricated universal joint or want of oil at the clutch collar. In fact, make sure that it is no part which is constantly revolving, as squeaks from an unlubricated shaft of any kind are very serious. Having satisfied yourself that all the running parts are properly lubricated, turn attention to the springs and brake rods. Oil all th pins and bearings, and if they are provided with grease lubricators take off each lubricator, see that it is filled with nice soft grease, and before screwing it home again push a wire into the hole in the spring pin and inject a drop or two of thin oil.

Having done this, the squeak may be stopped, but it is almost impossible to study spring squeaks on the road. The way to find them out is to take hold of the dumb irons, one with each hand, and lift the car up on its springs. This may sound a herculean feat, but no great effort is required, as if one pushes and pulls in sympathy with the compression and rebound of the springs, after two or three efforts the car begins to rise and fall three or four inches on its springs. If the springs are dry, the result will probably be a most distressing chorus of squeaks, and nothing can be done to stop them while the weight is on the springs. The thing to do is to take a couple of jacks and put them under the frame, so that the weight is lifted off the springs. To do this, it is usually necessary to use a stout piece of wood an inch or two wider than the frame and about three inches square, as the jacks have to be placed inside the frame to miss the springs.

The jacks will not be long enough to reach up to the wood, so it will be necessary to pack them up with some bricks or convenient pieces of wood. Having carefully jacked up the car, the leaves or plates of the springs will come apart slightly. They should be forced apart somewhat more than they come naturally by means of a stout screwdriver, and a copious dose of oil poured in between each of the leaves. Then a little grease should be pushed between each leaf by means of an old table knife. The blade of the knife should be thickly greased and worked up and down between the leaves of the spring. When this has been thoroughly done the jacks can be let down and the weight taken again by the springs, and the trouble of squeaking will be stopped probably for some months. The operation must be carried out both at the front and back of the car. Some people advocate the use of grease only for lubricating the springs when the weight has been taken off them, but we believe in the plentiful use of oil first, as that will penetrate down between the leaves where even the thinnest pallet knife cannot be pushed, or if it can the space between the leaves is so small that the grease is forced off the blade.

We may say that the operation does not merely result in the stoppage of spring squeaks, but the springs themselves work much more freely, and the car is much more comfortable over a bad road. We should add that we do not recommend the lubricating of springs in this way unless they squeak, as some run almost indefinitely without any tendency to squeak at all, but the great majority will be all the better for the attention suggested, as the squeaking is not only most unpleasant but, as we have said, the easy action of the springs is facilitated by lubrication, and last, but not least, rusting is prevented.

When the springs begin to squeak it is, as a rule, an evidence that they are beginning to rust between the leaves. We have found that most cars when new run a very short distance before the squeaking commences. This is due to the very careful washing and cleaning of the springs by the coachbuilders before painting. Such precautions are taken to remove all dirt and grease that the water is apt to be forced between the leaves more or less, and as every particle of grease is removed from the outside of the springs some of the penetrating cleansing materials used get between the leaves, and by the time the coachbuilder has finished with the springs there is very little grease left, and the more carefully he cleans them before painting the more effectually is every trace of lubricant removed.

Heating of Tires.

Although in a long run the tires become considerably heated, the cause for this is not well known. The heating is the direct result of the frictional action between the outer shoe and the inner tube. It can be in a large degree avoided by rubbing French chalk over the inner tube before it is inserted into the shoe; this reduces the friction between the two surfaces to a minimum, and, consequently, diminishes the amount of heat generated and the amount of wear experienced.

THE REPAIR SHOP

HANDLING GASOLINE.

Care and Carelessness, Safety and Danger In a Garage.

BY JAMES F. HOBART.

The man who once remarked concerning electricity, that "you never can tell when you've got it or when you haven't got it or when it has got you," could apply his remarks to gasoline with equal fitness. It IS hard to tell when the subtile fluid is going to vamoose for fair, and, strange to say, it never gives the least warning of its intention to go dry or to leak out of the can or tank at its own sweet will.

Aside from the vexation and delay, to say nothing of the danger from having gasoline loose in a garage or in a car, there are very good reasons why gasoline should receive the closest attention from the people who have to handle it. There are some things which are becoming pretty well known in regard to handling gasoline, but there are many other things of which the

Fig. 1—Impossible to ignite gasoline through fine wire cloth.

automobile owner or operator, particularly the men new to the business, are entirely unacquainted with and which should be fully known and understood by every man who has, or may have, to do with gasoline in the remotest degree.

To begin with, it is a popular fallacy that gasoline is an explosive substance, when on the contrary, gasoline can no more explode when ignited, than can a ton of coal or a cord of wood. Place some gasoline in an open vessel and ignite it. The fluid will burn quietly, though fiercely, of course, until it is entirely consumed. And the burning takes place entirely from the top surface of the liquid. There is absolutely no disturbance or explosion, the gasoline being consumed as quietly as if it were so much resin or paraffin.

As stated, it is not the gasoline which is explosive. It is the vapor of gasoline mixed with air which becomes so terribly destructive when ignited. But even the vapor of gasoline is not explosive unless largely diluted with air. It requires from two to five volumes of air to be mixed with one volume of gasoline vapor to form an explosive mixture. The automobile driver knows this to be very true when he finds that by regulating the quantities of vapor and of air with great exactness that he obtains the greatest possible explosive power from the mixture in the cylinders of his motor. He finds that if there be too little or too much air in the mixture, that the power of the motor is impaired accordingly. He also speedily finds that if nothing but the vapor of gasoline is present in the cylinders, that he might as well try to run the car with water or plain air as with pure gasoline vapor.

It was stated above that gasoline was not explosive. It may be further stated that gasoline is non-combustible as water or milk. No gasoline was ever yet burned, or even ignited. Neither was wood, coal, or any other substance ever ignited or burned. It is impossible to burn anything except a gas or gases. Before coal can be ignited and burned, it must be distilled into gas. So too must the tallow of a candle be vaporized into a gas after first being melted from solid to liquid form. The gasifying process may be observed pretty closely by watching the wick of any lamp or candle. The flame does not reach the fluid or solid combustible material. It only consumes the gas which is evolved from the combustible material by a portion of the heat developed during the act of burning or ignition.

It is the same with the gasoline liquid. Before that substance can be ignited, it must first be distilled into gaseous form. As gasoline gives off vapor at ordinary temperatures, the inflammable vapor is always present where gasoline is, but it is this vapor which ignites and burns—not the gasoline itself. It has been found that a gas cannot be ignited until it has first been heated to a certain temperature which enables its particles to combine with the oxygen contained in the atmosphere. And that is all there is about burning. It consists simply of bringing together portion of carbon and oxygen under conditions which permit them to unite with each other. And that also is all there is to plain "burning" or an "explosion." In the one, the portions of oxygen and carbon are brought together slowly and unite gradually and regularly, one portion after another. In an "explosion" all the particles of carbon are paired off with the proper number of oxygen particles to unite therewith. Then, upon the addition of a spark, the union is instantaneous, so to speak, and the carbon burns so suddenly that we term it an "explosion."

When we fill a can nearly full of gasoline, there remains a space above the liquid which is filled with gasoline vapor. When we have occasion to pour out some of the gasoline, a quantity of air, equal in volume to the gasoline removed, rushes into the can and the mixture of air and gasoline vapor becomes more or less explosive according to the amount of air and of vapor present. If there happens to be just enough air in the mixture to unite with the gasoline vapor, then contact with a spark will cause an explosion for the reason that all the vapor burns practically at once. But if there be too little air to unite with the gasoline, then the burning can only take place upon the surface of the body of gas. It can only burn as fast as air can get to it, unite in the proper proportion, and be heated to the point of ignition.

That the above noted theory of combustion is per-

fectly true, and that it holds good under all conditions, is proven in many ways. When the laws of combustion, as above briefly outlined are fully understood and obeyed, it will prevent absolutely any danger from accident or explosion as far as gasoline or any other volatile substance is concerned. Thus, to render gasoline vapor utterly unexplosible it is only necessary to prevent the gas from getting hot enough to ignite. It has been found that flame cannot be passed through a long tube for the reason that the walls of the tube remove so much of the heat that combustion cannot be supported.

The smaller the diameter of the tube, the shorter it can be and still prevent fire from passing through it. It has been found that when the diameter is exceedingly small that the length of the tube can be reduced to a very small fraction of an inch. The number of tubes must be increased to permit the required quantity of gas to pass through. By carrying this matter to extremes, it has been found that wire cloth fills the requirements perfectly. The meshes of the wire may be regarded as a great number of very small and very

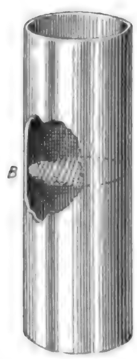


Fig. 2—Protective wire screen in gasoline pipe.

short tubes. And the conditions are so well met by wirecloth that gasoline on one side cannot be ignited by any flame, however hot, on the other side of the wirecloth.

This matter is easily tested. Place some gasoline in a dish and lay a bit of fine wire cloth over the top of the dish, taking care that the cloth presses fairly against the top of the dish, all the way around. There must be no chance for flame to get at the gasoline except through the wirecloth. Fig. 1 gives a good idea of what happens when this experiment is tried. The dish of gasoline, A, has a bit of fine wirecloth, B, placed closely over the top and fastened by the piece of wire, which effectually prevents any opening from remaining between the dish and the wire.

The gasoline vapor will rise above the wirecloth and may be ignited at D, but it will prove utterly impossible to set on fire the gasoline vapor which lies below the wirecloth.

Fine Wirecloth.

As it has already been shown that gasoline itself cannot be ignited under any circumstances—only its vapor can burn, it will be readily seen that the wirecloth forms a most efficient and perfect safeguard against fire, and the gasoline can never, never, "explode" when protected in the manner shown. The experiment may be made much more striking by applying the full force of a plumber's torch as shown, in Fig. 1. The intense heat of the bunsen flame is directed against the wirecloth at D, and the wire is soon heated red, or even white-hot. The wire may even be melted, or burned away if the heat be long applied, but so long as the wirecloth remained intact, it is impossible to ignite the gasoline vapor beneath the protecting wirecloth.

The blast flame may be directed against the side or bottom of dish, A, with result that the gasoline in the dish is boiled and gives off vapor very rapidly which quietly burns with no fuss whatever, as it rises through the wirecloth and reaches the upper side thereof where the vapor comes in contact with sufficient air to support combustion. But it is found utterly impossible in any way or manner, to drive flame through the fine wirecloth which covers the dish. True, if a very coarse mesh of wirecloth be used, flame could be driven through it, but with wirecloth below 20 meshes to the linear inch, flame will not be driven through, not even with a blast torch.

After you have tried the above described experiment to your satisfaction, the one illustrated by Fig. 2, may be tried with equally good results. Solder a bit of wirecloth into a tube, as shown sectionally at B, then fix the tube, into a can of gasoline, like a stopper, making tight around it with cloth rubbed with soap. Soap —common yellow soap is a mighty good thing with which to "putty-up" gasoline pipes when leakage is to be stopped temporarily. The gasoline has little or no effect upon common yellow soap and temporary repairs can be made with that substance to stand for several days or even weeks. Fix up two tubes like that shown by Fig. 2, then fit each as described into a can of gasoline as shown by Fig. 3, and pour the gasoline from one can to the other.

Try this trick once or twice, then touch a lighted match to the gasoline and continue the pouring. The fluid will seem to blaze and burn, but only the vapor which arises through evaporation of a portion of the gasoline really burns. The greater portion of the gasoline flows from one can to the other and there is not the slightest indication of any explosion. There can be no explosion for the reason that the air-mixed vapor inside the cans, which is the only material which can possibly explode, cannot be ignited on account of the wire screens in the can-spouts.

It certainly does look pretty fierce to see apparently blazing gasoline being poured from one can to another, but there is absolutely no danger whatever, except that some blazing stuff may fall upon the hands or clothing. Be sure to guard the person, and to be sure that the wire screens are in place in each spout before trying the experiment. Should the attempt be made to perform the experiment without the screens in either tube, then disaster will surely overtake the man who tries it. An explosion is to be expected and the force thereof will probably scatter fire and blazing gasoline in every direction.

With a screen, there is a perfect safety, therefore, never use any gasoline-containing vessel whatever without first applying a protecting wirecloth screen to each opening therein, no matter whether the openings are to be for filling or for emptying the vessel, or for the purpose of venting it to the atmosphere. Put a screen over each and every opening and then you are perfectly safe. Neglect the screens, and there is always danger and the possibility of disaster.

Recently this matter of safety gasoline handling has been taken up by a Chicago concern and they have brought the matter to a great degree to perfection. They have not only designed safety cans—which are absolutely safe—for every possible use of gasoline, but they have also perfected inlet and outlet caps for auto-

mobile gasoline tanks. With one of these caps in place, a stream of blazing gasoline could be poured into a tank with never the least danger of explosion.

The device is a patented one and consists of a piece of pipe several inches long with a wirecloth screen soldered into it as shown at B, Fig. 2. In addition to this, there is a row of hols drilled in the pipe close to the thread by means of which it is screwed into the autotank. A strip of wirecloth is soldered over the row of holes which serve to let out the air contained in the tank when gasoline is admited. In addition to the points above noted, the screw plug which closes the filling tube after the operation has been completed

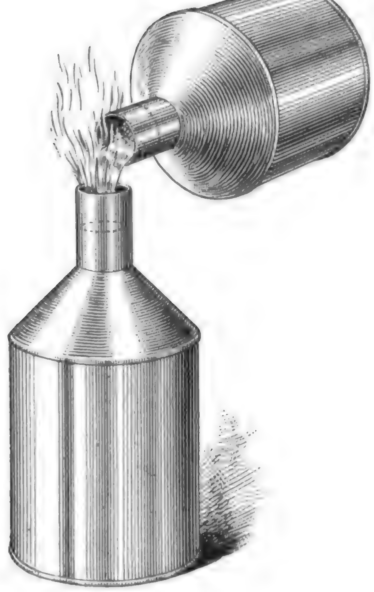


Fig. 3—Pouring lighted gasoline from one can to another.

is fitted with a small check valve, opening inward, and held in place by a very light spring. When gasoline is drawn out to the carburetter the little check valve opens against the light spring and air enters the tank to supply the bulk of gasoline which has been withdrawn from the tank.

With the inlet of an autotank protected as above, and with a wirecloth screen or two in the tubes through which gasoline is withdrawn from the supply tank, there is no possible way of getting the gasoline on fire inside the autotanks. There is, however, one more point which should be looked after. The pipe or tube through which the autotank is filled, should likewise be fitted with the protective wirecloth screen. Then, here is absolutely no danger that the supply will get on fire—something quite serious when the autotank is filled from a barrel or even from a larger supply of gasoline.

One of the prepared tubes may be inserted in the barrel or other source of supply with the assurance of perfect safety from explosion of gasoline.

Easy to Spoil the Brakes.

On long grades brakes should not be depended upon to hold the car. The ignition should be cut out, and depending on the length and steepness of the grade, a suitable gear should be meshed and the car allowed to coast under compression, the brakes supplying any further retarding effort necessary.

LUBRICATION.

As It Applies to All Roller and Ball Bearings.

BY SYDNEY F. WALKER.

As promised in the previous article, the writer proposes to discuss the question of the lubrication of roller and ball bearings. First the bearings themselves had better be explained. In both roller and ball bearings, as engineers express it, rolling friction is substituted for sliding friction. The meaning of this will be understood best by reference to a cart wheel. When the wheel is turning on its axle, in the ordinary way, when it is rolling over the ground, there is considerably less friction between it and the road, than when the wheel is skidded.

As we know, when going down hill, the ordinary cart wheel is usually prevented from turning, by a brake, or by any other means that are available, such as the old-fashioned drag, a piece of wood pressed against the wheel, or anything else. And the object of these arrangements is, to increase the friction between the wheels and the road, so as to check the speed at which the cart descends, and to ease the strain upon the horse in front of it.

In winter, in districts where snow lies for some time, and the roads become more or less of a frozen mass, the common practice is to replace wheels by skids, again for the purpose of increasing the friction between the vehicle, and the frozen mass it is running over. The difference between the skids, or ice runners, and the ordinary cart wheel, is the same as the difference between the ordinary sleeve bearing and the roller and ball bearing. In the sleeve bearing, the moving axle slides on the surface of the bearing. In the roller bearing, the portion of the bearing with which the axle comes into contact, rolls out of the way. In roller bearings, the solid sleeve is displaced by a number of small cylinders, held in a carriage, usually consisting of two discs, but in such a manner, that they are able to revolve, each upon its own axis. The carriage and the small cylinders together, make up the sleeve of the ordinary bearing. Figs. 1 and 2 show sleeve and rolled bearings diaframmetically.

In the ball bearing, the sleeve is still further divided up. The ball bearing consists of one or more rings of

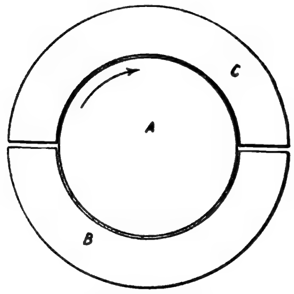


Fig 1—Ordinary sleeve bearing. The axle A slides on the stationary sleeve, B and C.

balls, held again in a carriage, the bearings and the carriage together taking the place of the sleeve. In ball bearings, the friction between the axle and the bearing, is still further reduced, because the balls are arranged to move freely in all directions.

With properly constructed roller and ball bearings, the friction is reduced, under the same conditions of working, to a fraction of that with sleeve bearings. But there are certain drawbacks.

The amount of friction between any two surfaces, depends directly upon the pressure between them, and

the pressure may be taken to be that portion of the load, taken by the individual bearing, spread over the surfaces in contact. In the case of wheels of a motor car for instance, the load is divided between the four wheels, and the load taken by each wheel, is spread over the surface of the axle, and the bearing with which it is in contact. As with a sleeve bearing, the two surfaces are in contact for from one-quarter to one-third of their surfaces, while with roller bearings the surfaces are very much reduced, and with ball bearings still further, the pressure per square inch between the axle and the rollers or bearings, is very much greater than in the ordinary sleeve bearing.

Hence, the lubrication of both roller and sleeve bearings, must be very good, the lubricant must be able to stand the additional pressure, or the result obtained is very much worse than with sleeve bearings. If for instance grit is allowed to get in, one of the rollers or if the balls may be worn, and not take its share of the load, this increasing the pressure between the axle and the other rollers or balls, which will become worn in turn. The axle itself also sometimes becomes worn, and the friction is very seriously increased in consequence.

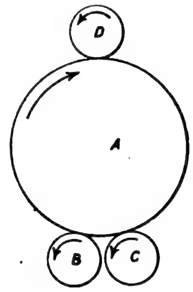


Fig. 2—Diagrammatic view of rolled and ball bearings. A is the axle, B, C and D the rolls or balls.

Inferior oils and greases often contain grit, which is deposited in the bearings, and particularly in roller and ball bearings, because from their construction, there are spaces between the rollers and balls, in which grit can lodge, working out again, and producing trouble. Fig. 3 shows the spaces in which it can lodge.

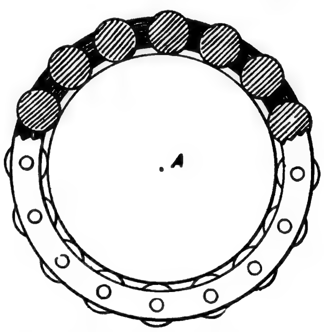


Fig. 3—Diagram of roller bearing with divisions between the rollers or balls.

Oil which contains grit, is oil that has not been properly cleansed. The oil when it comes up out of the ground, contains a lot of earthy matter, grit and other substances, which is carefully removed before the oil is put upon the market. The removal of all the grit is an expensive process, and therefore if a portion of it is allowed to remain in, the oil can be sold at a lower price.

In addition to this, certain substances that are very good for lubrication under certain conditions, such as animal and vegetable oils, sperm oil, and similar substances, have a tendency to deposit gum, wherever there is a chance of doing so. The gum deposits in the spaces referred to, between the rollers and the balls, forming a more or less solid mass, setting up friction between it and the balls and rollers, tending to prevent them revolving, and also as the mass becomes greater, setting up friction between it and the moving axle.

The moral of the whole thing is, do not be tempted to buy cheap oils, to supply your customers. It does not follow, because an oil is cheap, that it is bad, but it is probable that it is so. As explained above, the process of preparing oils, consists principally in the cleansing from dirt. Successive distillations of the crude product are carried on, for the purpose of separating the different oils contained, and the dirt is removed during the process.

As explained also in a previous article, certain combinations of the oils which go to form the substance known as crude petroleum, are found best for work lubricating roller and ball bearings, because they remain liquid under pressure withstand the entire pressure, and can be relied upon to follow the motion of the axle, and to continually interpose a thin layer of lubricant between the axle and the rollers or balls. If some of the wrong components of crude oil are allowed to be mixed with the others, as they may be by careless handling at the oil distillery, a similar result is produced, though in a minor degree, to that produced by the use of animal and vegetable oils. Good lubricating oil is the result of very careful cleansing of the crude product, very careful distillation, and very careful blending.

Cleaning Out Tire Covers.

The vulcanizer at a garage informed us recently that about 20 per cent. of the tubes passing through his hands for repair showed signs of dirt having been dropped into the cover when one bead had been detached by the roadside, and having afterwards set up friction between cover and tube when the tire was replaced. Consequently whenever a tube is changed by the roadside, before the new tube is inserted the interior of the cover should be mopped out from top to bottom on each side with a dry rag first of all; the wheel should then be spun to loosen any road dirt or grit in its interior, and when one is certain that all foreign matter had dropped to the bottom of the cover at the lowest point of its circumference, that part of the cover should be carefully mopped out with a rag slightly damped. The cover may then be relubricated with French chalk in entire certainty that the new tube will behave guilelessly.

Foreign Matter in Cylinders.

The engine ran very hot, and burst a cheap sparking plug, causing part of the central wire and some large pieces of porcelain to descend into the cylinder. There was no time to face the prolonged job of detaching a cylinder, so a jack was put under the side of the car remote from the engine valve chamber, and raised till the chassis was tilted well over. As the tilt was insufficient for our purpose, we had to repeat this process with the valve side of the chassis standing in the gutter and the jack out on the road. The valve plug was then taken out and the starting handle jerked till the rising piston threw the fragments of the errant plug into the valve chest, whence they were gleefully extricated by means of a bent wire. By this simple expedient a whole hour was saved, and, incidentally, we learned a valuable moral, to wit, that a cheap plug is also troublesome.

TROUBLE DEPARTMENT.

Questions answered by the Y. M. C. A. Automobile School, 322 West 57th St., New York.

This department is intended to be a "trouble clearing house," and it will be esteemed a favor if our readers will add information to it from their own experience or knowledge.

Shock Absorbers.

Question.—Will you kindly give me the benefit of your advice on the shock absorber question? I am a reader of your paper, but do not remember that I have ever seen an exposition on the value of the full eliptic spring on a car weighing 3,000 pounds equipped. I have a full set of friction absorbers, but have hesitated about attaching them, fearing that they would make stiffer riding. I know that they are valuable for heavy shocks, but I have had the idea that they would not absord the small vibrations of the road which the eliptic spring takes up. Please advise me fully concerning your opinion. Should you wish to publish this query with your answer kindly write me in advance so that I may know whether to attach my absorbers or not while I am having work done on my car this winter.

Answer.—Our experience with several good makes of shock absorbers has been that they are very valuable for heavy shocks and will protect the spring on the rebound, but they do not absorb the smaller vibrations and therefore make a less easy riding car. Heavy straps of the proper length from the body to the rear axle and rubber bumpers on both axles will protect the springs from the rebound and also from heavy shocks.

Cure of a Knocking Engine.

Question—There is a knock in my engine which can be felt very plainly on the cylinder head only. This knock only occurs when the engine runs idle or on low gear or high speed. The connecting rod has no play at either end and the crankshaft is also tight and no rings are broken. Timing and mixture are O. K. What can it be? It has good power also. Could a slight wear on sides of rings cause this or not? How could side wear of rings be fixed?

Answer.—The knock you describe seems very much like a wrist pin knock, but if you are positive these are properly adjusted we would suggest that you examine the valve push rods. These sometimes do not get proper lubrication and stick, causing a very perceptible knock. The valves may be gummed so that they stick. This is very likely to occur if the exhaust valve is oiled, the heat from the exhaust valve being so great that the oil is burned and the carbon formed causes the valve to stick for an instant, returning to its seat with a snap. If the cam is keyed to its shaft, the key may have become loose. This would cause a knock at high engine speed.

It Misses Fire.

Question—An auto with a 2 cylinder opposed motor and Splitdorf coil misses fire in cylinder and fires in the exhaust very much, apparently all from the same cylinder, when the engine is started and the spark is not advanced. Also when the throttle is nearly closed and spark retarded or in slowing down the car for any purpose. But after the engine gets warmed and the throttle is well open and running at good speed, no missing is apparent. Have examined the igniting equipment and the only ill found was a slightly smaller spark on the missing side, which made me suspect a leak of current somewhere, but am unable to locate any.. The opening from the carburetor (Holly) enters the intake manifold about 2 inches nearer the missing cylinder.

Answer.—We would suggest that you examine the gasekts between the inlet manifold and the cylinders. If there should be a leak in one of these gaskets it would allow enough air to leak in when the throttle is partly closed to materially affect the mixture. With the throttle wide open and with the engine running at a high rate of speed this would not affect the mixture enough to cause it to miss fire. We would also suggest that you test the compression. If the cylinder that causes the trouble has weak compression examine the valves to see if they seat properly.

Battery Testing.

Question.—Kindly advise me in your next issue the following: After testing batteries with ammeter and finding out the amperes and volts they register, how far or how many hours will they carry, and how much should they register before replacing with new ones?

Answer.—From the limited information given it is almost impossible to say anything definite. You do not say whether you refer to dry cells or a storage battery. The condition of dry cells is tested by amperage only and this will depend upon the size of the cell. The size generaly used will show from 22 to 28 amperes when in good condition and are no longer fit for automobile use when they test below 5 to 8 amperes. The voltage remains practically the same throughout the life of the cell. A storage battery is tested by voltage only, and a three cell battery, the type generally used for automobile work, will register 7.5 volts when fully charged and 5.1 volts when fully discharged. It is impossible to tell the length of time a battery will run a machine as this depends upon the make or condition of the battery, the type of timer used, the type of coil used and the style of engine.

Glycerine and Water.

From H. P. Talbot, Massachusetts.—Are you not mistaken in the statement made in your issue of January, 1909, on page 288, regarding the "freezing dangers," where you state that in a glycerine-freezing solution there is a separation of the glycerine and water when the machine is at rest? I do not believe that you will find any warrant for a statement of this sort, and I assume that it is not your desire to mislead the readers.

It is true that glycerine is much heavier than water, but it is miscible with it, and after mixing, the glycerine does not separate. It is, of course, conceivable that there may be such combinations of materials in some of the freezing mixtures on the market as would cause a separation, but I can hardly believe this is so.

(Note by the Editor.—That glycerine can be mixed with water should have been stated in the paragraph Mr. Talbot refers to, but that it is difficult to mix with water so that the mixture shall be permanent, seems to be the experience of some who have used it for the purpose described.)

A Tire Valve Difficulty.

From H. B., Massachusetts.—Being held up one day last season with a puncture, and only one tube left—a Continental—I put this in, but found I could not get any air to stay in it when pumping it up. I took out the valve. Continental valve pins are of metal, and

I found one-half of the metal pin head had broken off. I searched among the spares for a fresh valve, but could only find a Michelin valve with rubber-headed pin. This fitted the valve stem, but on putting the pump on found I could get neither air into nor out of the tube. I was about to prepare for a roadside vulcanizing job when it struck me that the two valve stems might be different in shape inside, and that the rubber-headed pin might have got caught somewhere, and so prevented any air from passing. Finding this to be the case, I removed the Michelin pin and cut a V groove in the head of it, after which my trouble was over.

How to Protect Tires.

From B. F. Martin, Indiana.—In your January issue I notice some one suggested under the heading, Tires in Winter, to cut off the rim of old tire castings and slip over the tire. As this matter suggested itself to me more than a year ago, I tried the same and find it impossible to keep the tire on without lacing after the rim is cut off. But following the idea, I forced the old tire over with the clincher rim on, and find it superior to any of the so-called tire protectors. I also take my old tubes, remove the stem, and valve, split the tube on the outside, cut large enough hole to permit the stem of the good tube to come through. Lace the same on the slightly inflated tube and tie in place with ordinary wrapping twine. Put the same in the casing and replace on the wheel in the ordinary way and inflate. In this manner I have never had a puncture and have saved a blowout in a tube with a hole in may casing one-half inch long. It also protects the tube next the rim from pinching or chaffing between the clincher ends. In fact, tube troubles are ended, and a good place to utilize old tubes that are useless for anything else. After this put old casings over good casings and your tire is puncture proof.

The manner of applying the old casing is a little difficult to the beginner, but by following the instructions below it can be done with little trouble compared to the benefit derived:

First, jack up your wheel. Deflate the tire completely; turn the wheel so the air valve will rest on the ground. Take the old casing and put on at the bottom. Then let the wheel down by removing the jack. Then take a block thick enough so you can catch the inside rim of the casing at an angle of 25 or 30 degrees in front of the hub. Expand the jack until the rim is forced partly over the wheel or enough to hold. Then catch again about straight over the hub and follow up around the wheel until the casing is forced over. Then pump up the tire and your tire troubles are ended.

The clincher or quick detachable are the only casings to use. When on they form a neat fit and will keep your tire like new indefinitely.

Care of the Electric Parts.

From "Chatterbox," Ohio.—In reading the last issue I could not but notice the articles of practical interest, but in my own experience in the care of my own machine I have found that the electrical parts give the most trouble, and that the ground wire from the chassis to the battery is often very much neglected. Always examine to find that it is in proper shape. I look over every connection to see that it will perform its part. First of all there are my battery connections. Then I take out my spark plug and lay it on the metallic part of the cylinder and take a brass wire and connect it to the stem of the steering wheel or some other part. Then I get the buzz to produce the right kind of spark. I also examine the spark points and set the points to see that they are sure fire. Then if all is right, I am ready to proceed on a long trip with no further trouble in that part of the machine.

Stuffing Boxes in Ford Runabouts.

From F. W. Taylor, New Hampshire.—I have a Ford runabout and thinking perhaps that some of your readers might be interested in a recent experience I had with it, I take the opportunity to give it herewith.

I have run the car for a season and a half and have had little or no trouble. During the latter part of the last season I had some little difficulty with he water leaking out of the radiator around the pump shafting. I asked several repair men about a remedy and they all said nothing could be done. I accordingly had a mechanic make me a new shaft, and for a few days the leaking did not bother. It soon began again and kept up more or less all fall. I wondered several times why the manufacturers had not fitted a stuffing box on the shaft and was thinking of having a mechanic make one for me. The other day, in taking the shaft out, I discovered a nice little stuffing box already there which had escaped my notice and that of two different repair men before. The stuffing box consists of a brass bushing with a left hand thread with notches cut on the end next to the pump for inserting a tool to unscrew it and repack. I would suggest that all owners of Ford runabouts look into this matter if they have any trouble with water leaking out around the shaft.

How to Minimize Starting Troubles.

From Herschel Millikin, Ohio.—If some of your readers will try the following method in stopping their engines, they will find that they will have hardly any trouble starting their motor the next time it is used. In stopping the motor be sure to run with the spark retarded and throttle open as far as you would in using low gear. Next turn off switch and allow the motor to slow down until perfectly still without changing the throttle. The advantages gained are that it draws a sufficient amount of gas into the cylinders, thereby doing away with the frequent coal oiling and allows the motor to start on first trial.

A Brazing Formula.

From H. B. Bland, North Carolina.—In a recent issue some one asks for a brazing formula. I get best results as follows: Make the joint to be brazed a good fit, but not too tight. Bring to a red heat. Apply a little flux; let it flow well into the joint, then bring it to almost a white heat or hot enough to make the brass flow pretty free, turn the piece over and over in the fire and let the brass run in well and let it cool in the air. I use wire spelter and borax (powdered) for flux and never have any trouble in getting a good joint the first time on either steel, iron, or cast-iron. I always use a forge except for real light work, bicycle tubing, etc.

A Good Pointer.

From Harry Clifton, Indiana.—For a temporary patching of casing of tires, in case of a cut, I get a piece of rawhide that will just reach around the tire and clamp in the clincher rim just as the tire does (don't have the piece too long or too short.) Keep

the tire pumped up tight and it will hold just as well as the clincher tire. It makes a much neater job than to tie it round with strings. The piece of rawhide costs from ten to fifteen cents. I don't see many doing this, but I have done it a good while and think it a good plan as it holds the cut closer together.

Flexible Steel Hose for Gasoline.

From A. B. Karreman, M. D., Chicago.—I recently installed a very convenient and cleanly arrangement in my garage which may interest some reader. It is a flexible steel hose, one end connected to an elevated oil tank, while the other end has a faucet attached. With this contrivance any angle or height can be obtained. It does not leak, and works absolutely satisfactory. I use three-quarter inch hose.

A Non-Rattling Tool Box.

A box of four or five trays was first procured consisting of four or five trays laid on top of each other, and coupled together by clamps. The owner had then melted down some wax in a pan and poured it into each tray in turn till the wax was nearly flush with the lip of the tray. Then while the wax was still warm he had pressed deep into it the desired tools, first greasing them to prevent adhesion, so that as the wax solidified each implement had a bed which fitted it exactly. To prevent rattle a pad of thick corduroy, cut to fit the tray, was interposed between the tools in one tray and the bottom of the tray above. At our suggestion the same idea is now being extended to another case designed to hold spares. Some of these are of awkward shapes, especially the extra valves. Two tin trays are being made for these to fit inside the trays of the chest, and after one is full of wax the valves will be pressed in this no more than is sufficient to half cover them; then the other tray full of warm wax will be pressed down upon them, and so they will be entirely covered. The grease with which they are coated to prevent their sticking to the wax will also serve to protect them from rust. This method of carrying tools is both cheaper and quieter than shaped wooden beds.

Good for Aluminum Surfaces.

For the preservation of the surface of aluminum foot and running boards, the following is going the rounds just now: "Brush the surface over well with a proportion of about five to eight parts of water to one of acid. This is applied to the surface with a stiff bristle brush, and the surface well rubbed, after which the excess acid is removed with water. Another method sometimes recommended is to make a mixture of turpentine and fine emery, which is applied to the surface with a bristle brush. After vigorous application and rubbing, the surface of the metal will be restored.

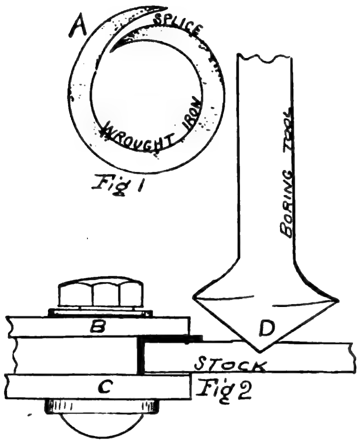
Keep Out the Rust.

Once let rust attack the polished surfaces of balls or races, and the corrosion will soon result in destruction of the bearing. For this reason ball bearings should never be run dry; grease and oil not only act as lubricants, but also prevent rust attacking the steel. The oil used, too, must be perfectly free from acid, as this will corrode the bearing. Hubs are best stuffed full of vaseline, because this helps to keep out damp, and as these bearings revolve comparatively slowly in the road wheels, a thick lubricant answers just as well or better than a thin one. It may be taken generally that the lighter the load and the higher the speed, the thinner should be the oil which is used for balls.

USEFUL COLLARS.

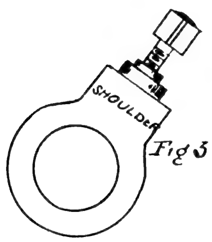
Why a Variety Is Necessary In a Busy Automobile Repair Shop.

Collars of steel, wrought iron, cast iron, brass and other metal are useful in the repair and construction shop, as is well known to men who spend their working hours in the establishments where motor vehicles are fixed and built. The various sized collars are so great in importance that in some shops one may find a division set off for collars alone, in which there are the



necessary pigeon holes for containing the numberless descriptions of collars all fixed with set-screws or keys in readiness for immediate application.

Of course the split collar is the quickest for applying and this collar is always found in the shop ready for prompt service on a shaft when needed. But for permanent service, the solid collars are preferred and these too are kept in stock. The forged collars are harder to make and more costly to finish than the cast iron collars, but they are well worth the additional labor and expense. An advantage of the forged collar is that it is within the possibilities of the repair man to make such a collar with the tools and materials he has at hand. The cast collars require considerable



apparatus for melting the stock and for casting the shapes in moulds of sand or in fixed metal flasks. Hence, in the event of the automobile being delivered at the shop for a repair in the line of a collar setting, a visit is first made to the assortment in the collar department.

If the selection of collars includes many sizes and shapes, the chances are that a collar can be selected from the lot to fit the place where needed on the motor vehicles. Oftentimes the most complete assortment of collars fails to include the particular size and shape of collar needed. There may be a man in charge of these collars and he may take interest in the same and endeavor to keep up with the requirements in sizes and forms. Nevertheless, occasions will arise in which off sizes and designs will be needed and then resort is had to the forge where the strip of wrought iron is moulded about a form to create the required kind.

The collar is readily made by the man who is familiar with forging articles. In fact, many of the best men in the repair shops of the present time are graduates from the blacksmith shops. These men understand

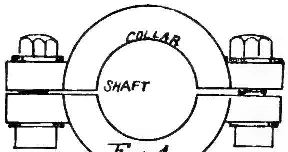


Fig 4

metals. They can forge out any description of casting to take the place of a broken casting on the machine. They are handy men about the shop. Therefore the practical repairman takes his piece of bar iron and cuts it the right length for forming the ring. Then he reduces the ends to a splicing form as in Fig. 1, and proceeds to unite the same by heating and hammering in the good old fashioned way. A crudely formed ring follows, which must be turned or worked down to the correct size and smoothness. A hole is bored for the tapping for the threads of the setscrew, or a keyway is cut for a key. The splicing ends are marked (A). Then again there are men who form the necessary collar from a piece of flat metal, as in Fig. 2. The stock

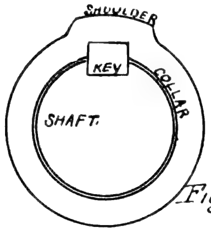


Fig 5

selected should be of the thickness desired for the width of the ring. The stock is held securely in the grip of the pieces of metal (C and B) by means of the clamping screw bolt. The clamp is secured beneath the boring tool, so as to hold the stock where the cutting edge of the tool (D) may drill the hole. Thus the bore is made. But collars made in the way shown in the first two cuts lack shoulders. A shoulder adds greatly to the resisting property of the collar when a setscrew is employed as well all know, because we have all had many ruptures in collars due to cracking where it is weakened by the bore for the setscrew or the keyway for the key. Hence it is a good plan to

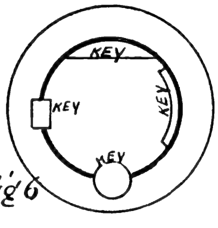


Fig 6

add strength to the collar by using the shoulder as in Fig. 3. Such shoulders are usually cast on a collar made in moulds. They can be worked out at the forge, only considerable labor is required.

The ordinary split collar with ends like box caps is shown in Fig. 4. This collar is usually cast. It is also made at the forge. It can be found in brass and in several types of metal. It is possible to get quite a firm grip on a shaft with this design of collar and these kinds should be retained in stock in the collar division of the shop.

Then there are the classes of collars which call for a key to retain them in place instead of a set screw. Fig. 5 is one of this character. The great error is made in this kind of a collar by not allowing extra metal for the shoulder part where the key is cut. The shoulder is often missing. Hence, when the ring is slotted, the removal of the metal greatly weakens the ring at that point. You can find collars held to the shaft in the shop in many different ways, according to the ideas of the workman who has the job in hand. Fig. 6 shows a variety of collar fastening systems. There is the oval shaped key at the top, which slides on a flat surface and depends entirely upon frictional contact to

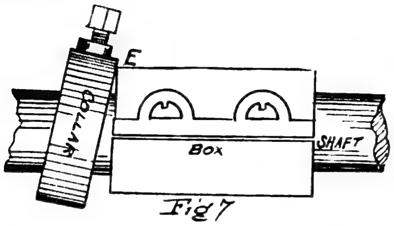


Fig 7

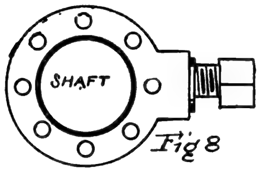


Fig 8

hold the collar. There is the common form of square key at the left and the flat key at the right with the round key at the bottom. The different methods have their merits and their advantages as might be expected. For my part, the common square key answers all purposes. Still the round key is handy to bore for and drive in. I have seen collars shabbily adjusted on shafts of automobiles, resulting in accidents.

Not long ago a slipping shaft was fixed with a collar adjusted next a box as in Fig. 7. The repairman failed to find a collar of the right size and he slipped

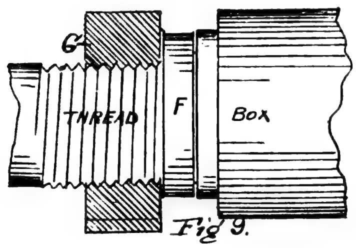


Fig 9.

on one of too large bore. The set screw was used to take up the slack. The set screw failed in its mission after a short run, and only the edge contacted with the box as at (E). This let the shaft out of gear and an accident followed.

Ingenuity is often used to repair broken collars. In Fig. 8 we show a collar of cast iron which had split and which was fixed by a repairman shaping a piece of sheet metal to correspond to the size of the collar, and this sheet metal was used to re-inforce by rivetting the same on as shown. Thus the collar was held together.

There are threaded collars in use. One is shown in Fig. 9. The shaft carrying the collar is cut with a thread up next the bearing where the collar is to be used, in this case being marked (F). The collar (G) is shown in section. The collar is simply turned on tightly. The repair finds that repair work on these collars usually involves cutting of new threads, or pinning the collars to make them cease turning off and loosening.

COLOR AND HARMONY.

What the Recent Automobile Shows Teach the Painter.

BY M. P. HILLICK.

The recent New York automobile show, as well as some similar exhibitions held across the Atlantic, have their lessons for the painter engaged in painting the horseless carriage.

First of all, they prove that no one or two, or even a half dozen, colors dominate, or promise to dominate, the field of colors for automobiles. One might write, and correctly, too, that the popular colors range in variety all the way from white to black. Gray, blue, brown, green, maroon, red and numerous lakes chiefly occupy the field. The tones and shades of these colors are almost without number, and afford the painter plenty of opportunity for varying the color. Harmonizing and contrasting colors are to be, if we may expect show indications to be fulfilled, largely in evidence, although the color effects are to traverse quiet lines, and are in no sense to verge on the "loud" or sensational class.

The jobbing shop painter, to which class THE AUTOMOBILE DEALER AND REPAIRER comes especially with its message, can well afford to give this matter of color for the horseless carriage earnest heed, for, after all, color and finish are the main issues with the automobile owner and user. If anything, lakes, the deep rich, luminous ones, are this season to be more popular than ever. Maroon has for a quarter of a century been a popular carriage color, and upon the automobile it is likewise popular. Its relationship to the lakes has had something to do, doubtless, with the latter's growth in favor.

Striping as we generally understand the term will be less conspicuous than in preceding seasons. Effects in alternate striping of color as seen at both the recent New York shows, and late foreign shows, are certain to capture, to some extent, at least, the fancy of the provincial auto owner; and to have this information in hand will be of advantage to the jobbing shop painters. Indeed, this study of colors and their adaptation to styles of surface is an important feature of the repainting business. There are automobile surface forms in great variety which disclose the real beauty of their outline only when clothed in colors of unusual brilliancy. Regular and angular surface forms should be coated with brilliant colors, whereas surface forms of an opposite character are seen to best advantage under more quiet or subdued colors. The suitability of color to form is to enter more largely into the problem of making choice of colors for the automobile than the case formerly.

The finish upon the automobile may pass even as a work of art, but if a bad choice of colors or an equally unfortunate disposition of them upon the surface is made, the workman's whole creation must come into condemnation. In good automobile painting and finishing there can be no discordant elements. Harmony must run through all the processes and mediums employed. In the repainting business this is no less true than in the factory painting of the new machine.

No deterioration in the grade of finish applied to the automobile will be accepted the coming season if we may believe the evidence accumulated at the New York shows. In fact, there is a marked tendency toward a more uniformly fine finish for the automobile both in runabouts and touring cars. To the man engaged in the repainting business this will be welcome news, for it means better work and correspondingly better prices for the work. In the past enough varnish coats, as a rule, have been applied and sufficient skill employed in applying them to produce surface of a high order, but there has been manifest neglect in the primary surfacing processes, and in the surfacing of the rubbing varnish coats. Lack of uniformity in surfacing, in brief, has prevailed to the detriment of the finish. These points the jobbing shop painter cannot afford to longer ignore.

With the more general introduction of the lakes in the painting of the horseless vehicles more detailed information relative to their use will be necessary. In the main, the ground work should correspond as nearly as possible to the color of the lake. Avoid making the grounds too light. Broadly speaking, the lakes are rich and lustrous in proportion to their depth. Munich lake, a rarely beautiful pigment, and crimson lake, require deep, warm red grounds, although the latter should have a little lighter ground. Important, too, in this connection is the preservation of the purity of the lakes as they are coated upon with successive coats of varnish. A little of the lake coloring matter stirred in the various coats of rubbing varnish will effect this result.

What a Few Drops of Water Did.

A friend is usually particular to open the drain tap of his radiator and those on the cylinders to let out the water after a run, and particularly in cold weather. In spite of this he started out one morning—closing the taps and filling the radiator first, naturally—but when he had gone some six or seven miles he noticed that the water was boiling and steam coming out of the overflow pipe. He pulled up, removed cap from radiator, and, with the engine still running, peered inside to see if the water was still circulating; apparently it was, quite as usual, and plenty of water, too. He was decidedly puzzled, for there was no sign of a cracked cylinder, the fan was working well, and all seemingly in order. Happening, however, to glance inside the radiator again he saw that no water was then issuing from the engine; then it flowed again for a while, stopped once more, and so on.

What had occurred was this. There had been a severe frost during the preceding night, and, although he had drained the radiator and cylinders, a little water had remained in the bottom of the circulating pump. This, no doubt, had partly frozen, so that when he started the engine in the morning the taper pin securing the "runner" to the pump spindle had sheared. The ice had melted when the engine warmed up, and then occasionally the runner would grip the spindle—"seize" temporarily, as it were—and cause the water to circulate for a few moments, but not for any length of time. Natural sequence, water soon boiled.

Moral.—Remove drain plug or open the cock at bottom of pump in frosty weather, as well as those on radiator and cyinders.

Speed and Inertia.

Accidents have been caused by lady passengers, even when advised not to do so, taking their own way and jumping out of motor cars before they have come to rest. Last month the daughter of a well-known car owner stepped out of her father's car when it was moving at least eight miles an hour. Immediately she touched the ground she was thrown down sideways, cutting her face badly. If she had only aligthed in the direction the car was going she would have got

off better, but as it was she was quite unable to protect herself. Her error of judgment was no doubt due to want of experience of pace and to the fact that the car had been travelling pretty quickly just before the accident. On another occasion equal ignorance to this was displayed by a gentleman who was sitting at the back of a powerful car of the open type. Suddenly meeting a "hump" in the road where it crossed a brook, the car bounded into the air, leaving the ground for several feet. "Stop, stop, for goodness sake, stop," he yelled; "you will be dropping me behind on the road in a moment." Asked what he meant, he replied, "Why, don't you see, I will be jerked so high that the car will shoot away from under me."

Incidents of this kind bring before us what is really a new form of our schooldays' puzzle as to what happens when a weight is dropped from the mast head of a ship travelling at full speed. In most cases the answer is that the weight strikes the deck some distance behind the mast, most people forgetting that the weight has the same initial velocity as the ship, which it does not necessarily lose in its descent. The same thing applies to the case of a car travelling at a uniform velocity, a shock such as before mentioned merely causing a passenger at the most to leave his seat, but yet to retain a relative vertical position to it. Hence he will land again in the same position as before, and any fear of the car shooting away from under him is groundless. Of course, such a thing is just possible, provided the car can be sufficiently accelerated, and that the occupants are thrown high enough to allow them to clear the back of the car. Anything of this kind is, however, very remote, as to accelerate sufficiently for this requires a much longer interval than is found in practice.

Aluminum Car Bodies.

For automobile bodies the principal claims of superiority of aluminum over wood are lightness, durability, beauty of curves and finish, quickness and ease in repairs and low cost of maintenance. Lightness is shown in the fact that large limousines of wood ordinarily weigh from 1,200 to 1,400 pounds, where large aluminum limousines vary in weight from 950 to 1,100 pounds. There is shown to be a difference in weight between wood panels three-eighths of an inch in thickness—the thinnest wood panel used—and aluminum panels of nearly half a pound to the square foot in favor of the metal. Nor do aluminum bodies require so heavy a frame as wood bodies. Durability is found in the fact that there is no shrinkage in aluminum and it is not affected by the weather or elements, as is the case with wood, which may crack or shrink with extreme heat or cold. Aluminum lends itself to all the curves and shapes requisite to produce the most beautiful and attractive lines and therefore produces a more graceful body than wood.

Even in the detail of painting a marked superiority is claimed for aluminum, which requires only ten coats, as against seventeen for wood. Six preliminary coats are required for wood to bring it to the same stage at which the first coat will place the metal. The latter when sandpapered offers an ideal surface for paint.

In preparing the two types of materials for bodies it occupies six weeks to complete the painting of wood, as against four weeks for the metal. The paint on the former is 75 pounds, whereas on aluminum the weight is less than half. The cost to paint the wood body is about 30 per cent. more than to paint the metal body. In case of injury to a section of the aluminum body it can be more quickly hammered into shape again, whereas the damaged section of a wood body requires an insertion of a "Dutchman" if not entire replacement.

WINTER USE.

More Points Relating to Cars in Cold Weather.

The one time above all others when care is necessary to maintain a car in good condition, both as regards its mechanism and its appearance, is the winter season. A few years ago, it was the habit of the automobilist to stor his car away during the winter months, but to-day any car that is worthy of the name can be considered as an all-weather street car. Still, tsere are some people who prefer for various reasons to wrap their cars up and forego their use until the sun shows signs of regaining power. For them it is a simple enough matter to see that every part is thoroughly cleaned, and polished, the bright metal parts being subsequently wiped over with a thin coating of good oil or gasoline, the wheels permanently jacked up and tires removed, repaired as to cuts in the thread and stored away in a warm, dry place, and all dust removed from the rims of the wheels.

The brake rods in the brake-actuating system should be closely watched and should be kept soused in oil. Neglect is even more fatal to these portions of a car than it is to the majority of the others, for the damage goes beyond a spoiled appearance. Rust indicates a weakening. Then the tires should be exhaustively examined after every long run, and not at the end of each week or month, and all cuts in the tread filled up before the car is taken out on the wet roads again. It is a good plan, by the way, and especially if the car is very frequently used, to keep two sets of tires going during the winter months, for then a damaged cover can be given adequate attention, and it is not likely to be used before it is really ready for renewed service; in any case, the tires should be periodically removed from the wheels, the rims freed from rust and given a fresh coat of japan if necessary.

The individual automobile owner, as well as the automobilist who employs a driver, should be warned as to the necessity for care in the cleaning of coachwork, and, of course, the warning is strictly necessary in the winter, when the car is seldom used without receiving a plentiful splashing of mud. Mud-spots should never be allowed to dry on the body if it is in any way possible to prevent it; they should be removed directly thte car is taken to its house or garage.

Lamps, xcept when in use, should be covered with the dust and waterproof bags sold for that purpose. Unless the garage or barn is artificially warmed, the radiator should always be drained quite dry of its water, which all automobilists know—a precaution that is often overlooked until a frosty spell has actually arrived. Automobilists should realize that the climate of the States is entirely unreliable, and that even though it may be warm and damp over night it is just as likely as not that they will wake up in the morning to find the country in the grip of keen frost. They may find one of their four or six cylinders (cast en bloc, perhaps) with a nice, gaping crack in it.

Don't put your faith in some unknown anti-freezing mixture that may or may not be effective. Cylinders are expensive, water is not; also, when thinking of your radiators, remember the acetylene generators. Also, if the car is used for town work very much in the winter, it is useful to fit a non-skid band or chain and it will answer to put one on one of the driving

wheels, the rear-side one, and one to the off-side steering wheel, instead of having a pair on the rear wheels. Just try this for safety's sake, and you will find it as good as the two chains on the rear wheels. The reason for that measure is that a quick turn in the traffic is frequently necessary, and if there is a particularly wide lock on the steering a walzing movement is likely to result. When a skid of the back wheel occurs it is usually possible to correct it, but a front-wheel skid cannot be stopped by any means. The one advantage is that such a mishap seldom, if ever, occurs except when the car is travelling very slowly.

There are other points to be considered in connection with winter automobiling. The lubrication, for instance, may not be as effective at a given setting in winter weather as in summer time, and it may be necessary to readjust the lubritators to give an increased supply of oil. Starting difficulties also usually make their appearance in cold spells, and it is a good plan to squirt several drops of kerosene through the compression taps before putting the car away. This is only an attention that is necessary when the garage or barn is not artificially warmed; and the car should be covered over with a dust sheet, as it prevents moisture in the atmosphere from attacking the polish on the coachwork and upholstery. The engine will frequently run badly for a mile or so before it settles down to work. This trouble may be overcome if hot, or at any rate warm, water be used to refill the radiator before starting; it thins the oil in the engine and enables the piston to work more easily; and, if the carburetter be water-jacketed, will assist the automization of gasoline.

Frozen Water Jackets.

When the water is left in the engine in freezing weather trouble, of course, is expected, and if the frost be at all severe, trouble there will undoubtedly be; but it is rather galling after the water has been drained out of the radiator and engine to find that when the thaw comes he cylinder jacket is cracked after all. This happened on several occasions during the recent freezing spell, and more or less puzzled some of the sufferers, as they believed they had taken every precaution to run out all the water, of course opening the drain cocks on the cylinder jackets, and it is here they were deceived. Mud and sediment are apt to collect round the bottom of the water jackets, and as the water drains out of the jacket this sediment is very apt to stop the cock before all the water has been run off. The only safe way is to watch the water running out of the jackets, and directly it stops flowing the tap should be probed with a piece of wire. Nearly always more water will begin to flow, and directly it stops the tap shoud be probed again and again till no more water issues from it.

Wood Brake Ratchets.

It is well to remove the slightest possibility of the brake jumping off when the car is unattended. Not long ago the writer noticed a car being driven up to a house. The engine was stopped and the chauffeur put on the hand brake and went into the house. He had not been gone long when the car started forward and down a grade. Luckily, the front wheels were cranked and ran but a few feet into a wall. Little damage was done. The cause of the mishap was this: The teeth of the ratchet on the brake lever quadrant had become worn, and allowed the brake to jump off, and on three out of every five cars which have been in use for twelve months or more a similar condition of things prevails to a greater or less extent. One generally keeps the hand brake so adjusted that it is fully "on" when the lever is at a certain position—about two-thirds of its travel on the quadrant—and the consequence is that a few teeth of the ratchet become badly worn at this point owing to their frequent use. When this is the case there is always a probability of such an accident and it is advisable to examine this point on your car. If much wear is apparent, take off the quadrant, and, with a half-round or three-cornered file, make the defective teeth as deep as, and of similar shape to, those which are not worn. The pawl, or engaging piece, on the trigger rod may perhaps be worn also, in which case it should be filed to suit the teeth.

A Look at the Brake.

Sometimes the brake shoes, either on the countershaft, as the case may be, or in the drums on the rear wheels, do not clear when the brake is released. Occasionally, too the release springs which are sometimes fitted are weak, or one of the connecting rods rubs against the frame, etc. Or it may be that the brake shoes are covered with congealed oil, in which case they cannot clear the drum easily. The friction which is set up from one or other of these various causes not only hinders the speed of the car, but sets up abnormal wear. It is no wonder, then, that the brake power is often found to be insufficient when most needed. In some cases the addition of a small pair of release springs on the rear brakes has proved very beneficial when the shoes are included to rub on the drum. But before trying this plan, the shoes should be examined in order to see that they work freely and are not impeded in any way. It sometimes happens that no mechanical cause for loss of brake power can be found, and so some other cause must be sought. Occasionally the fault arises from an abnormal quantity of grease on the shoes. It is really surprising at times to see the quantity that collects between them and the drums, as one would have thought that the heat would be sufficient to melt it. The rear brakes seem particularly liable to this trouble, as a great deal of grease often escapes through the live axle and settles on the drums. Road grit is soon picked up and burnt by the heat, so that a hard, compact mass is formed, which effectually destroys the checking power. Another reason for the falling off of brake power is that when the frictional surfaces are worn the shoes may not be able to make sufficient contact with the drums on account of some projection in their neighborhood. A close search will sometimes reveal a slight obstacle such as the edge of a nut or shoulder of a bracket that only needs easing off for efficiency to be restored.

Care of Tires.

J. D. Anderson, president of the Hartford Rubber Works Company, of Hartford, Conn., says that one of the greatest evils the tire manufacturer has to contend with is lack of care of tires and carelessness in driving. One of the greatest enemies of rubber is its non-use.

A tire in use will last longer than one which is "laid up." Most touring cars are put up for the winter, and while it is true in most cases they are jacked up off the tires, as the same time in most every case oil or some substance which is harmful to be jacked up so that all the weight is taken from the tires. Many drivers, particularly beginners, apply the brakes suddenly or start with a jerk, which is all wrong, and not only one of the most severe strains on tires, but on the car and engine as well.

THE DEALER

THE CHICAGO MEETING.

Annual Meetings of the Directors and Members of The National Retail Automobile Dealers' Association.

The directors of the National Retail Automobile Dealers' Association held their annual meeting in the First Regiment armory on Tuesday, Feb. 9th, and discussed informally the work done during the past year and outlined a policy to be recommended to the members at their meeting the next day.

On Wednesday morning, in the officers' room, was held the annual members' meeting, and while the attendance was not as large as it might have been, the enthusiasm and interest manifest among the dealers more than made up for the small number present. The meeting was called to order by President C. F. Jensen, of Joliet, Ill. The minutes of the last meeting were read and approved. President Jensen then outlined briefly what had been done during the past year and what plans had been outlined by the directors to be recommended as the proper course to follow the coming year.

SECRETARY'S REPORT.

The secretary's report was read and adopted and ordered placed on file. It was as follows:

In making this first annual secretary's report it probably will not be untimely to go back to the causes which created the demand for an organization of this kind. Price cutting by jobbers and selling direct to the consumer probably was one of the principal things which caused the dissatisfaction among the dealers, and together with the same thing being done by some of the automobile and tire manufacturers there was feeling enough created to cause some one to start a movement which would tend to counteract and put a stop to a practice which was ruining the retail business and taking from the legitimate dealer his chances of making a living.

Just who may be responsible for the origin of this association is probably not known, but it is safe to say Mr. Eagge, of the Franco-American Auto & Supply Co., had more to do with the actual organization than any one else. He sent out advertising matter and circular letters to a great number of the retail dealers previous to the show held in December, 1907, and made arrangements for the first meeting to be held. Pursuant to his call a number of the dealers from the central states met and perfected an organization and elected the present officers and board of directors. A constitution and by-laws were drawn up and adopted after which the directors met and mapped out a course of action which they thought would result in a marked increase in the number of members. This constituted many plans and circular letters and different methods of advertising the association, and no effort was overlooked which would tend to place the association more before the retail dealer.

It was found to be quite a task to undertake to secure a reliable list of retail dealers and we are indebted to the Goodyear Tire and Rubber Company for our latest and most up-to-date list.

The matter of advertising ourselves and securing new members having been adopted, the next step which was undertaken by the board of directors was one which from its very nature presented a most foreboding aspect; in short, we tried to put a stop to the price cutting of tires and accessories. With this end in view, the board of directors invited the leading tire manufacturers to meet with them and confer with them on this most important matter. We had a large number of leading men of the tire manufacturers and they looked upon our association as one which was very much needed by the trade and offered to assist us in devising ways and means to put an end to this very malicious practice. They all agreed that they would lend every possible assistance to help up in putting an end to it.

We next took up the matter of accessories, and while we did not meet with the response and hearty co-operation as with the tire manufacturers, yet the majority of the accessory people agreed that it was bad practice and promised to lend us what assistance they could.

We occasionally are in receipt of complaints of some of our members that the tire manufacturers, automobile manufacturers and accessory people are selling direct to the consumer and wherever this was possible and the members give the names and addresses are prepared to back us up with facts, dates, etc., the secretary took this matter up direct with the houses or firms who were claimed by the member to be the guilty party. We have replies from some, but by others we have been ignored. We had a mattar of this kind with one firm and they did not think they were at all out of the way when they sold their cars to doctors or lawyers. This is perhaps the only instance where we were completely turned down.

We have published a little pamphlet which you have all probably seen. It took a great deal of time and labor in getting this little booklet before you and had it not been for the personal efforts of our worthy president it is doubtful if this little book would have been published, as he took it upon himself to see that this book was a success and it certainly was from an association standpoint.

We were represented by both the president and secretary at the show held in the Grand Central Palace, New York, in January. We think a great deal of good was accomplished as it brought us in touch with many eastern dealers who did not even know there was such an association as ours in existence. The A. M. C. M. A. very kindly extended us space free of charge. Through its secretary, Mr. Reeves, your president and secretary were shown every courtesy and favor which it was possible for him to do and for which we offer our very appreciative thanks. We might add here that the Licensed association has done the same thing for us at this present show here in Chicago through their secretary, Mr. Miles.

While at the New York show we ascertained that the mail order houses were in the east to buy up a supply of sundries and automobile supplies with the idea of putting same in stock. Mr. Jensen immediately got out a circular letter to the accessory manufac-

turers and explained to them our position in the automobile business and tried to show them what an injury the acquiring and distributing of automobile supplies by mail order houses would do to the retail trade. We have received answers from a large majority of these manufacturers saying that they would not sell goods to mail order or cut price houses.

We have long been of the opinion that we should have some official publication through which we could reach our members and the retail dealer who was not already affiliated with us, and while at the New York show we adopted THE AUTOMOBILE DEALER AND REPAIRER as the official organ of this association, and in the current issue appears the first article, by whose means we hope to attain the desired membership.

While the past year has been one of hard work and slow returns and there has been many expenses incidental to the starting of an organization of this kind, the association has done remarkably well owing to the fact that the members of the board of directory who have attended the meetings have been unselfish enough to have paid their own expenses when the association was not able to do so. The indebtedness of the association is practically nothing. When the president and secretary have involved the heavier expenses owing to the fact that we have had the correspondence and the trouble and expense of meeting in Chicago in order to take up some matters which could not be done by correspondence. This together with the expense of a trip to New York have made these two offices more or less of a burden.

In looking backward upon the past year we cannot complain about the results which have been accomplished, however. We have a few ideas which if carried out would in our minds materially assist the organization and add greatly to the strength. We would recommend where there are six or more members in a state that they be asked to unite the retail dealers of their state into one state organization, which organization should be a branch of the national association.

We are about to take up with the New Jersey association the matter of their affiliation with us and we are now in correspondence with some of the dealers in Florida with the same idea.

We would recommend that the states of Wisconsin, Iowa, Illinois, Indiana, Ohio, Kentucky and Missouri be the first in the west to act upon our efforts toward the state organization.

Sometime in the future when the membership is sufficient to warrant, we would recommend that a paid secretary with a central office be established.

The president and secretary wish to thank the board of directors for the confidence and assistance which they have rendered them in the past year and we hope that whoever may assume the burden of directing this association to the final success will have the hearty assistance and support which we have had.

ELECTION OF OFFICERS.

A committee of two consisting of Mr. Fanberg, of Wisconsin, and Mr. Travis was appointed to audit the books. The election of officers resulted in the election of the old officers and directors intact as follows:

C. F. Jensen, Joliet, Ill., President.

Rudolph Hokamm, Madison, Wis., Vice-President.

J. A. Crum, Oshkosh, Wis., Secretary.

L. Ohnhaus, Ft. Wayne, Ind., Treasurer.

J. C. Fanberg, Eau Claire, Wis.; J. B. Sutter, Burlington, Ia.; D. W. McClure, Oskaloosa, Ia., Directors.

The President and Secretary were authorized to make arrangements to employ solicitors to secure new members and perfect state organization.

The board of directors were instructed to make such changes in the by-laws as will enable them to increase the dues and initiation fees, secure selicitors for increase of membership, to take steps toward incorporating the association and establishing state organization and affiliating them with the national association. After considerable informal discussion the meeting was adjoined to the next regular meeting.

An unusually great interest was taken by the retail dealers on the floor during the show, and many applications were taken.

It is safe to say that nine-tenths of the automobile business is done through the retail dealer and it seems strange that these same dealers should receive such slight consideration as they had at the Chicago show, in the matter of admissions. It was impossible to secure tickets on Saturday and Monday morning a line of a hundred dealers stood at the armory entrance in the cold waiting until the two attendants at the window could examine the dealer's pedigree and family history before issuing a ticket which would admit him at the back door, twice a day before 5 p. m. Should the dealer desire any dinner and return to the show he was compelled to pay the regular admission fee.

We cannot see why the legitimate dealer should not be admitted on the same grounds as the other dealers in supplies and parts.

To the dealers who at the Shows had not the time to go into the benefits to be derived from joining this association, we would urge that he look up the benefits secured by members of similar organizations, and send in his application at once. There is no doubt of the results. We all need an organization and the trade needs it. Come in and be one of us.

Oiling Improvements.

The tendency is to make the ordinary care of a car as easy as possible, partly by improving durability, partly by making everything accessible to which access may be required in the course of ordinary service, and partly by simplyfiing the processes of cleansing, adjusting, filling, and oiling. The number of minor bearings in the steering gear, pump, fan, springs, brakes, and gear-shift brake, and clutch-control is very large, and an hour spent going from bearing to bearing with an oil can is just as much to be deducted from the usefulness of the car as if it were spent repairing the radiator. It is a curious fact that some designers, even of the best cars, have not fully grasped this fact, and continue to put out automobiles with absurdly inadequate provision for lubricating these numerous minor bearings. In other cars, however, grease cups large enough to hold lubricant for many hundreds of miles may be found on every spring-end and steering gear joint, while the bearing points under the floor are covered with dust-proof oil covers large enough to hold several good-sized squirts of thick oil. It takes but a second to give a grease cup a turn, and cars equipped as just described, can be fully attended to as regards oiling in a few minutes once a week. The logical result is that such cars are kept oiled when others equally well-made but slighted in this particuluar, are developing squeaks and rattlings.

Never leave a cut cover, but clean and fill at the very earliest opportunity.

TIRE BILLS.

Easy Enough to Make Them Heavy and Hard to Make Them Light.

The care of magnetos, or carburetters, of radiators, of transmission and of other features that are more or less complicated may require special mechanical knowledge. The care of tires requires little but the experience of practical common sense. Concerning this. G. M. Stadelman of the Goodyear Rubber Co. says:

"The chief differences in tire values lie in the various secret processes and patented features controlled by the different manufacturers. So far as brains, science and sincerity are concerned, I am positive that most tire manufacturers—our competitors as well as ourselves—put the very best at their command into their product. But even if tire construction continues to improve for another hundred years tires will still be at the mercy of the driver or owner who is too indifferent to pay attention to their welfare.

"With care and by applying to the selection of tires only about one per cent. of the thought and study that he gives to the car itself any owner can reduce his tire expense fully one-half. After deciding upon the make of tires, the owner's first consideration should be to see that they are large enough. Most owners, however, take everything in this connection for granted. Without paying any attention to the load per tire recommended by the manufacturer, the average owner immediately begins to add weight. He puts on a top, shock absorbers, heavy lamps, a gas tank or generator, a special kit of tools and one or two storage batteries in place of dry cells. He thus makes his tires carry a load of several hundred pounds more than they were made to bear. And then he wonders why they give out quickly.

"For our part we have given up hoping that owners will ever change in this respect, and as a result we have for a long time been making our tires oversize. All Goodyear tires are larger than the average tires sold for the same size. This is a point requiring no training to verify, and any owner can test his tires when buying them by merely measuring their diameter.

"The subject of inflation is fully as important as that of proper size. It is the air in the tire that carries the load and furnishes a cushion to absorb the unevenness and roughness of the road. And, more important, it is the air that neutralizes the outside pressure against the tire and avoids strain and pull on the fabric and composition. Insufficient air leaves the tire without the support it needs and is entitled to; it permits more 'play' and 'give' with disintegration as the inevitable result.

"It is asking too much of human nature, however, to expect any one to put all the air needed into a tire with the old fashioned pump, and to overcome this a number of inflating devices using gas have been put upon the market with great success.

"The Goodyear air bottle can be carried under the seat or on the running board. It will wholly inflate more tires than even an unlucky driver is apt to have road trouble with in a year, and will do the trick in a few seconds. It is equipped with a register to indicate the amount of inflation and costs little more than a good pump. Even if it were expensive it would soon pay for itself in added life to tires, due to proper inflation.

"With tires sufficiently large and properly inflated only one thing, aside from cuts and punctures, will shorten the life of a good set of tires, and that is reckless driving. By this it is not meant that speed is injurious. There is little friction or wear on a tire in high speed on the straight. It is the man who wants to do fancy stunts, such as taking sharp corners at speed, who is eating the life out of his tires. Throwing brakes on suddenly and thus causing tires to rub along the ground, starting suddenly and thereby throwing all the weight and impetus of the car on one part of the tire—these and similar irregularities all show in the bill for tire troubles."

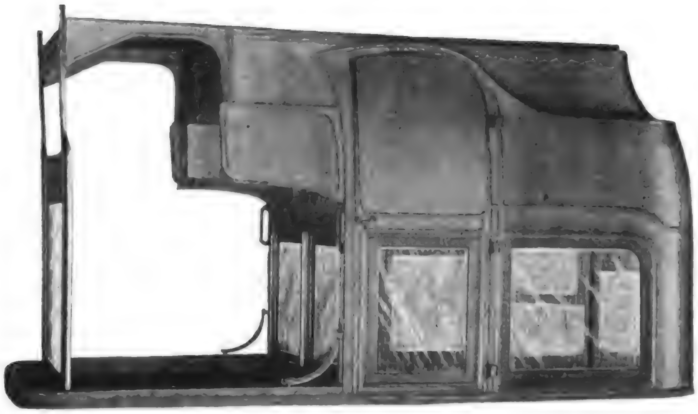
The Frozen Pump.

When putting away the car for the night in any place where water is likely to freeze the owner or driver opens all the drain taps, while possibly he will remain until the water has reached the "drip" stage. Trouble, however, begins the moment he turns his back, for the water pipes, relieved of the warm water, rapidly cool down; but there still remains a film of water on the walls of the pipes, which slowly drains away to the lowest point, this in many cases being the pump. While this is proceeding the pump has reached freezing point, when, instead of draining away, the water congeals in the pump, and the latter is eventually more or less choked by solid ice. The water pipes being in a more protected, and therefore warmer position, the water will continue to drain down them to the pump, perhaps for a considerable time after ice has formed there, so that the pipes themselves also become choked with a plug of ice where they connect to the pump. In the morning water is put in and the starting handle is vigorously turned. This puts the pump out of commission. The same thing can happen even when hot water is put in, because the plugs of ice in the pipes takes an appreciable time to melt, during which time the blades or gear wheels in the pump still remain fast. It is as well, therefore, to wait for the water to flow freely from the pump tap before turning the starting handle. As the engine turns stiffly when cold, and one has great leverage through the starting handle, the pump spindle may be badly damager without being aware of anything wrong. The spring drive is in such cases of value, for springs will tend to wind up if the pump be fast.

Premature Ignition.

Occasionally an engine, which has been running perfectly, will begin to give forth a slight tapping sound. It is not sufficiently pronounced to be called a knock, and very often it will puzzle you to know what causes it. You will, in the majority of cases, put it down to some slight peculiarity of the valves. As a matter of fact, it is nothing of the kind, but is due to very slightly premature ignition. Of course. when an engine begins to labor with the ignition too far advanced, there is no doubt whatever as to the cause of that thumping; but the comparatively light tap caused by only very slight premature ignition is not usually recognized as the first symptom of too advanced firing. It will be found that this tapping invariably occurs when some slight increase in resistance, either through an upgrade or traffic slack causes the engine speed to be momentarily reduced. When this transpires the retarding of the ignition by a notch or so will, on all cars provided with a moderately delicate ignition regulation, put the matter right at once.

Automobile Body Work.—Those of our readers who have body work of any kind to do or have some one else do, will find it to their advantage to consult the Schubert Bros. Gear Co., of Oneida, N. Y. This firm has long been known in the carriage trade and in taking on automobile tops as a part of their business have embarked in something that they are especially well equipped for, both as to the matter of quality and price. They are designers and builders of high grade automobile bodies, in all styles, limousines, landaulets, taxicabs, coupes, touring cars and runabouts, in the wood panels or aluminum panels, also finished bodies complete, painted and trimmed, ready to mount on the chassis. Also any other style of bodies are made to order for automobile use. They also manufacture a first class line of automobile tops, seats and trimmings. As this work is generally made to order, they are prepared to furnish designs and drawings, also quote prices on application.



Limousine Body. Manufactured by the Schubert Bros. Gear Co., Oneida, N. Y.

Royal Crown Automobile Soap.—We wish to call the attention of all our readers who are interested in the proper care of motor cars to the advertisement, appearing for the first time in this issue from the Crown Soap Co., of Syracuse, N. Y. This company manufactures the celebrated Royal Crown Automobile Soap for washing cars. This soap is made of vegetable oils entirely. It contains no free alkali. It is guaranteed to be absolutely uniform in quality. It has great cleansing power, and by its use an antomobile may be cleaned in the quickest possible time. It does not and cannot injure the varnish or impair the polish of any car; on the contrary it will keep the car bright, as well as clean. The H. H. Franklin Manufacturing Company, well-known manufacturers, say,: "We have been using this soap for about three months and find that it has fulfilled all our expectations. In fact we have never found its equal for removing dirt, and withal it does not affect the luster of the varnish. We would certainly recommend Royal Crown Soap to those who require a first-class article to be used on highly finished surfaces." The manufacturers of Royal Crown Soap, anxious to introduce their article to our readers will send a generous sample absolutely free of charge, the only condition being that you should mention this journal. The same company also manufacture Royal Crown Metal Polish, an excellent preparation. Good agents are wanted in open territory for both these specialties. Write to the Crown Soap Co., 1947 West Fayette Street, Syracuse, N. Y.

Ignition Devices.—The Philadelphia Timer and Machine Company, 326 Vine Street, Philadelphia, Pa., is placing a variety of new ignition devices on the market. Among them is The Velos Make and Break High Tension Distributor. It is an ingenious device for a single coil, which may be of the plain or vibrator type, mechanically timed sparks in a multi-cylinder engine. The only moving part in this simple distributor is a brass casting and its construction is such that long life is assured. The action is positive and regular. The distributor is placed on the time shaft of the motor without any changes whatever. It reduces the current consumption required and will give a hot spark while consuming only 1-10 ampere, thereby greatly increasing the mileage radius on one set of batteries. Either a plain non-vibrator or a vibrator coil can be used at pleasure. It can be adjusted from no contact whatever to about 60 degrees contact. The only adjustment ever needed is made by turning on hand screw, which is self locking and can never loosen. The distributor ring is pure hard rubber and the action is noiseless. Another of their productions is a combination long and short contact timer. This is called The Velos Selective Contact Timer. It is a combined roller timer and make and break timer in one and has two circuits, either of which can be thrown on by a switch placed where most convenient. The construction of the make and break is similar to that of the distributor. The whole thing is simple and not likely to get out of adjustment. Both of the above devices are made in ball as well as plain bearing. This concern also make a complete line of timers of every description.

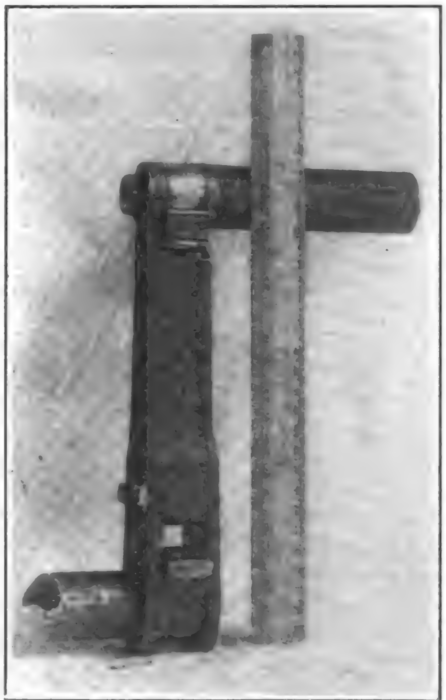
Lubricating the Motor.—A handsome booklet has recently been issued by the Joseph Dixon Crucible Company, Jersey City, N. J. It is entitled "Lubricating the Motor," and deals with the subject of lubrication of automobiles, motor boats and motor cycles.

The booklet opens with a brief treatment of flake graphite lubrication. A good point is developed concerning the advantage of flake graphite when combined with oil or grease, due to the lack of sensitiveness of flake graphite as compared with oil or grease. We quote:

"Oil or grease are probably the best known reducers of friction, but they are too sensitive—their range of highest efficiency is extremely narrow. As conditions rise above or fall below, those which are normal for any given oil or grease, its efficiency drops rapidly. Too high a temperature thins the lubricant and so weakens it that it cannot support its load; excessive heat disintegrates both oil or grease. If the temperature is too low the lubricant feeds too slowly or exerts a retarding force because of its great viscosity. Speed and pressure are important factors—no one oil or grease can well adapt itself to wide demands in either particular.

"How different is flake graphite; always the same under all conditions. Heat does not diminish its efficiency, nor does cold make it sluggish. Pressure does not squeeze it from the bearings and it is indifferent alike to high speed or low. Even acids and alkalies cannot affect it."

A New Starting Crank.—Illustrated herewith is a new self-contained starting crank, the cut showing a roughly constructed working model which the inventor built up himself. This crank is made on a different principle than others in that it does not unlatch at a predetermined pressure, and does not require a separate part bolted to the engine or chassis to unlatch it, which makes it specially desirable for marine and stationary engines where the flywheel hub is generally flush with the end of the crank shaft. For with a specially designed clutch it can be used in such cases. Any style clutch to fit any engine may be made integral with it in place of the one here shown.



Starting Crank. Patented by L. S. Tuttle, Eastport, L. I., N. Y.

It has 72 chances in every revolution of unlatching.

Patent has already been granted on this device but it is not yet quite ready to be put on the market. The patentee is L. S. Tuttle, Eastport, L. I., N. Y.

New Battery Tester.—The Connecticut Telephone & Electric Co., Inc., of Meriden, Conn., have just placed on the market their new type 1909 dead beat meter for testing batteries. These instruments have many improvements of note over the 1908 style. A new etched metal dial now replaces the paper card dial which is universally used for this purpose. This dial is not only a handsome addition to the instrument, but adds greatly to its accuracy, also doing away with the trouble of warping and bulging out, which causes the pointer to stick in

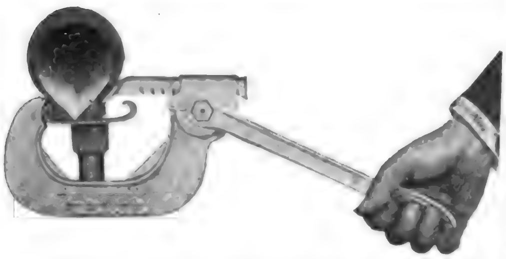
taking and reading. The entire interior construction has been changed and is now made up on the dead beat principle. A new type of pointer construction has also been added.

The Connecticut Company are making a great many different styles of pocket battery motors. Their volt ammeter is really two instruments in one, the voltage side being used for testing storage batteries. The ampere side is used for testing the

Manufactured by the Connecticut Telephone and Electric Co., Meriden, Conn.

condition of dry batteries, each cell of which should be tested separately. This new type of instrument is a worthy addition to the already large line of high grade Connecticut products. For further details address the firm as above and mention this magazine, if you please.

THE L. & M. TIRE SHOE LOOSENER—The L. & M. Tire Shoe Loosener, illustrated herewith, is designed to loosen tires that rust or freeze to rims. The clamp has a guaranteed tensile strength of 63,000 pounds. The tool complete weighs 3 lbs., is 9 inches long over all, and is finished with plain white nickel plating. The detachable



Tire Shoe Loosener. Manufactured by the Long & Mann Company, Rochester, N. Y.

handle permits the clamp to fit in tool boxes. In operation the outer end of the clamp is first placed against the bead of the rim on the opposite side from the operator, the body of the clamp extending underneath the rim. The rack is then placed in position, with the flange of the rack resting against the bead of the tire over the bead of the rim. Then the handle is placed in position, and with a backward pull the tire is forced away from the rim. The tool loosens the tire all the way around, between spokes as well as above them, and is so made that both sides of the shoe may be loosened with equal ease. The tool is equally useful for any make of tire or rim, whether clincher or quick detachable. The company also makes a tool longer than the one illustrated, to force quick detachable tires clear off the rims as well as to loosen them. It is manufactured by the Long & Mann Co., Rochester, N. Y., to whom requests should be made for further information.

KIRKHAM MOTOR.—In this issue for the first time will be found the announcement of the Kirkham Motor Co., of Bath, N. Y., with an illustration of the motor they are offering. This motor, it is claimed, has several important advantages which cannot be explained in an advertisement and the manufacturers, therefore, would like to send one of their catalogues giving full particulars not only with respect to their motor, but considerable valuable information about motors, and will do so upon receipt of a postal card or letter mentioning THE AUTOMOBILE DEALER & REPAIRER.

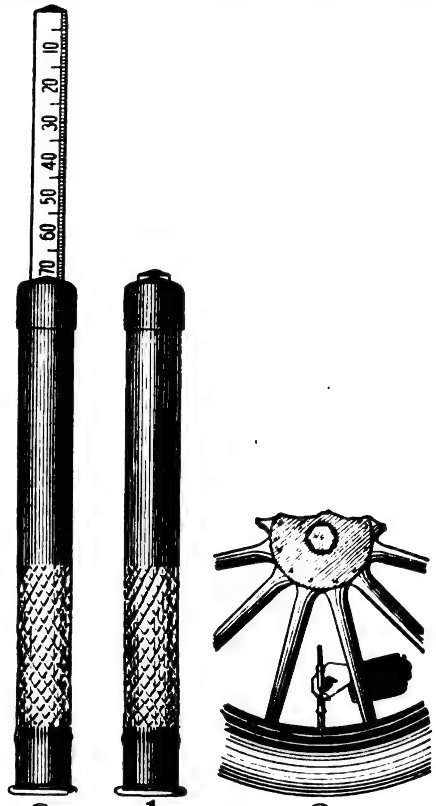
RETREADS THAT RUN 5,000 MILES.—Repair men are invited to consult the advertisement of the Goodyear Tire & Rubber Co., of Akron, Ohio, in this issue, and to note their offer to make quotations and send circulars free. They say that to retain your repair business, you need a better quality of material and that is certainly a reasonable proposition. This stock is made by a secret formula and it is well worth the while of our readers to investigate it carefully. In writing mention the AUTOMOBILE DEALER & REPAIRER.

"INST LIGHTER."—With this device, the manufacturers, The Inst Lighter Co., Columbus, Ohio, say that gas lamps on automobiles can be lighted by simply turning a gas cock and electric switch, both located on the dash of the car, where they can be reached without stopping or getting out. There is a good profit to dealers on this article, and the manufacturers would like to send their catalogue and special proposition to dealers to any reader who may be interested.

A GOOD GREASE GUN.—The Miller standard quick operating grease guns are now recognized as standard size and equipment for all cars, and sold at popular prices. The gun can be filled and emptied in 30 seconds and all consistancies of grease can be used. Grease can be ejected easily without waste. The power of the double spiral worm is wonderful, made of solid bronze and will last for years. Every gun fully guaranteed. The manufacturers' name is stamped on all guns. Send for quotations and mention THE AUTOMOBILE DEALER AND REPORTER.

TIRE REPAIRS.—Since the prices on automobile tires were reduced the business of tire repairing has dropped off perceptibly in many quarters. As the price of crude rubber is higher than before it has seemed difficult to make repairs in proportion to the reduced prices. For this reason not a few repair plants have been closed up during the winter months. In the face of this condition The Goodyear Tire & Rubber Company reports that their repair plants at Akron and their several branches are running steadily and the sale of their materials is increasing rather than diminishing. This they explain by the fact that high grade repairs can be made with Goodyear stock by Goodyear methods at a price at which the consumer can afford to have his damaged tires repaired. Their expert repairmen in the factory have been experimenting on improved methods for months with the result that they have been able to produce better repairs at lower costs than ever before. These facts will be of interest to automobile tire repairmen and the Goodyear Tire & Rubber Company will be glad to give this information to any one in the business. See advertisement on another page of this issue in regard to quotations and samples. Mention THE AUTOMOBILE DEALER AND REPAIRER.

TWITCHELL AIR GAUGE FOR TIRES.—In a recently published article Hiram Maxim shows just how improper inflation is responsible for the great majority of tire



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Twitchell Air Gauge. Manufactured by the W. D. Newerf Rubber Co., Los Angeles, Cal.

troubles. A tire insufficiently inflated and passing over even slight obstacles, is bent or depressed at an angle which quickly causes a rupture in its fabric; whereas the properly inflated tire is depressed scarcely at all, presenting the strongest possible resisting surface. The uninformed or the careless automobile user blames the tire, when the fault is insufficient air pressure and nothing else. He may try all kinds but he finds the results the same. Mr. Maxim concludes: "The only way properly to inflate a tire is to use a Tire Pressure Gauge to measure what pressure is actually in the tire." The accompanying illustration shows the Twitchell guage closed, extended, and applied to an automobile tire. It is only three and a half inches long, can be carried in the vest pocket, and is always ready for use. It can be applied in two seconds, and the registration is instantaneous and guaranteed to be correct. It can be applied at any time and at any place, without inconvenience. It will not get out of order with any reasonable use.

It is claimed that the Twitchell Air Guage will save the automobile owner many dollars by enabling him to keep the air in his tires at the proper pressure; that it will lengthen the life of the tire and reduce susceptibility to injury to the minimum.

The W. D. Newerf Rubber Company, Los Angeles, Cal., is arranging to put the Twitchell Guage on the market all over the country.

TO AUTOMOBILE AND SUPPLY DEALERS.

One year ago this Association was organized for your benefit as well as for our benefit as dealers, and since that time we have worked cheerfully without remuneration and given our time and money.

The Association to-day is composed of dealers from nearly every state in the Union.

We appeal to you to co-operate with us and to do it at once, for now is the psychological moment to act. Get busy and send in your application for membership with check. See blank below.

If you, Mr. Dealer, will do this and do it to-day, we will be strong enough to approach manufacturers and jobbers and stop not only the ruinous methods which are now being used, but we can also avert general **disaster to our trade** (such as is threatened) by showing the manufacturers and jobbers that it will be to their interests to co-operate with us. This can only be done by a strong organization.

The accessory business is by no means the only feature which we expect to take up.

The car proposition, to some of us at least, is of equal and even more importance. Why should we be made to suffer because two rival bodies of manufacturers are fighting for supremacy? The policy of the A. L. A. M. to curtail your liberties and dictate to you what policy you must pursue in your business if you wish to handle any of their products, is unjust and detrimental to our interests.

It is needless to say if all the cut rate and mail order houses in the country are going to be able to get, at practically their own price, all standard automobile supplies, there is no further use for us in this line, and we feel, as dealers and officers of this organization, that if this feature of the business is going to get away from us, many will not be able to make even a living.

Applications for membership may be made to the Secretary, J. A. Crum, Oshkosh, Wis., and checks may be made payable to the National Retail Automobile Dealers' Association.

Yours respectfully,
NATIONAL RETAIL AUTOMOBILE DEALERS' ASSOCIATION.

C. F. JENSEN, President.
J. A. CRUM, Secretary

TEN REASONS WHY YOU SHOULD BE A MEMBER OF THE National Retail Automobile Dealers' Association.

1—**BECAUSE** the N. R. A. D. A. was founded and is being conducted by legitimate Retail Automobile Dealers and not by hired, highly salaried outsiders. The membership fee of $4.00 is insignificant in comparison to the benefits to be derived.

2—**BECAUSE** the jobber and the Supply House is just waiting for us to get together and cut rates and promiscuous discounts will cease.

3—**BECAUSE** the quarrels of the licensed and the unlicensed car manufacturers should not be allowed to interfere with your business.

4—**BECAUSE** the "fly-by-night" Dealer fostered by present conditions may, at any time, jeopardize your business.

5—**BECAUSE** the Association will prevent demoralization of prices by assisting in placing cars which a manufacturer is sometimes compelled to throw on the market.

6—**BECAUSE** the Association can be made a powerful factor in the movement for good roads, which is as vital to the Dealer as it is to the individual Automobile owner.

7—**BECAUSE** the Association has a plan to assist you in disposing of the second hand cars which you are compelled to take in trade.

8—**BECAUSE** the loss, or at least part of the loss, you suffer on your sample or demonstrating car ought to be borne by the manufacturer.

9—**BECAUSE** the Railroads are using an unjust classification on which to base the freight on Automobiles.

10—**BECAUSE** the Dealers, by united action, can compel attention and if necessary, force an adjustment of grievances; you may need our united support the very next day.

And, as you are well aware, there are other good reasons, too numerous to mention.

Join Now, and get the benefits at once and help to increase them,

For convenience, the following form of application may be filled in, cut out and forwarded to the Secretary, J. A. Crum, Oshkosh. Wis., with check made payable to the National Retail Automobile Dealers' Association:

SPECIAL ARRANGEMENT WITH THE AUTOMOBILE DEALER AND REPAIRER.

We have been fortunate enough to make an arrangement with the publishers of the AUTOMOBILE DEALER AND REPAIRER by which we can furnish membership in the National Retail Automobile Dealers' Association, and a subscription to THE AUTOMOBILE DEALER AND REPAIRER for a year at the regular membership fee of the Association, namely, $4.00.

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MR. J. A. CRUM, Sec. N. R. A. D. A., Oshkosh, Wis.

I herewith Enclose $4.00 as Fee for Membership for the Term of One (1) Year in the

National Retail Automobile Dealers' Association

and a Subscription for one year to the AUTOMOBILE DEALER AND REPAIRER.

I am Agent for the Following Cars: ....

....

Name .... Post Office ....

Street .... State ....

Direct Agency Sub Agency

Vanguard Wind Shields and Bumpers

are built of the finest material, mechanically perfect and so constructed that they become an integral part of cars to which they are attached.

WIND SHIELDS $35 — TRADE MARK VANGUARD REGISTERED — BUMPERS $12 and $15

We are the pioneers in honest priced Automobile accessories. **Watch for our new patented Spark Plug.** Write for our new Catalogue and Booklet, "Way Ahead," and get our terms and discounts to dealers.

Vanguard Manufacturing Company,
112 CASS ST., JOLIET, ILL.

AUTOMOBILE INSTRUCTION.

The West Side Y. M. C. A. Automobile School is now beginning its fifth year. It is the largest in the United States. Students come from all parts of the country. The very best instruction is provided in learning to understand, repair and operate Automobiles.
Send for catalogue.

322 West 57th Street, New York.

THE PRACTICAL GAS ENGINEER.

A Manual that tells what a Gas or Gasoline Engine is. How to Purchase a Gas or Gasoline Engine. How to Install the Engine. How to Operate it. How to care for it. What to do when it gets Stubborn and How to do it.

This is a complete, plainly written work, containing the practical points needed by a purchaser, owner or operator of a Gas or Gasoline Engine. Written by Dr. E. W. LONGANECKER, a gasoline engine expert of ten years' experience, now Secretary of one of the largest gas engine factories in America. You cannot afford to be without it. Sent by mail, postpaid, to any address, upon receipt of price, **$1.00.** Address

MOTOR VEHICLE PUBLISHING CO., 24 Murray St., New York.

Auto. Educator.

EVERY OWNER, OPERATOR AND INTENDING PURCHASER SHOULD HAVE THIS WORK.

This book was written to meet the need for a simple but comprehensive treatise of motor car construction and care—a book that is not only a necessity to the motor car owner, but also useful to the skilled engineer and mechanic.

Being clear and concise in its treatment of the subject, and is comprehensible to the most inexperienced man. At the same time it is so thorough and detailed that the expert will learn much from its pages.

The treatise on gasoline cannot fail to prove valuable to any one interested in explosive motors, which are daily coming to the front as the readiest and most convenient source of power. ¶The price of this popular edition is $2.00, and as an insurance against accidents, caused by ignorance of the principles of operation—of which there are a lamentable number recorded every day—no one interested in the subject can afford to do without a copy of this timely volume.

Sent Postpaid Upon Receipt of Price, $2, by

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24 Murray Street, New York City.

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EASY WITH
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Booklet and Sample 10 Cts. . . 50c per lb.
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CHEAP TIRE SALVAGE
GRAY'S INSERT, $1.25
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Ignition Storage Battery
Send for instructive Catalogue and price list
AMERICAN BATTERY COMPANY
178 S. Clinton St.
CHICAGO, ILL.
Established 1889

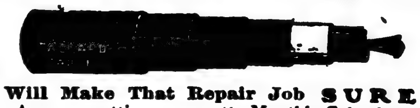
We Make  AUTOMOBILE TOPS

Auto Upholstery, Slip Covers, Dust Covers and Wind Shields, also Limousine, Landaulet, Touring and Runabout Bodies Fitted on Chassis.
ALSO LETTERING AND SCROLLING.
YONKERS AUTO TOP CO.,
16 Nipperhan Street, Yonkers, N. Y.

4X4 AIR COOLED MOTORS

$80.00 each for Mar. only
Transmissions, $23.00 each.
Write for Catalogue.
AUTO PARTS CO., 52 West Jackson St., Chicago, Ill

PACKARD CABLE



Will Make That Repair Job SURE.
Are you getting our pretty Monthly Calendars?
THE PACKARD ELECTRIC CO., Warren, Ohio.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

Hello Sheldon!

" While on a railroad train in Kentucky recently, I was studying my Sheldon lessons; a gentleman came past and said, 'Hello, Sheldon.' He also was a Sheldon student. We discovered there were two others in the car, making a total of four out of seven traveling men on the train " M. E. L. CRAMER, American Sales Book Company, 808 National Bank Building, Nashville, Tenn.

This letter shows two things very clearly; first, that Sheldon students are becoming thick in this country; second, that Sheldon lessons help you improve your spare time in a way that means greater efficiency in your business, and hence more money out of your business.

You had better spend some of the time on the train equipping yourself to do more business off the train.

The Sheldon School helps men in every line of work—clerks, stenographers, industrial workers, professional men—as well as salesmen. Read what a former office employee has to say:

" By studying your course I have been enabled to avail myself of an opportunity to accept a position as salesman. The increase of my income amounts to 30 per cent."—**M. C. ARVIDSON, Former Stenographer; now Salesman for the Burroughs Adding Machine Company, P. O. Box 522, Des Moines, Iowa.**

Salesmanship is the best paid of all professions. The salesman's work is pleasant. He travels and becomes rounded out by his association with many kinds of men; a salesman is practically his own boss; so long as the results are right he is free to do his work as he pleases.

A good salesman is never out of a job. There is always a demand for the man who can produce the business.

We have helped hundreds of young men into the lucrative profession of salesmanship.

Employers as well as employes, managers as well as their men, study and endorse the Sheldon Science of Salesmanship. Here is evidence:

" I am a firm believer in Mr. Sheldon's work. I have found it very helpful in my own work, and I think no man who conscientiously studies the Course can fail to benefit by it."—**Wm. H. Ingersoll, of Robert H. Ingersoll & Bros., New York City.**

The principles that helped the men quoted here to greater success will help you. We have thousands of letters like these given here. More than 36,000 men have subscribed to our Courses in five years.

THE SHELDON BOOK tells the story of the Science of Salesmanship, how it came to be founded, how it increased the earning capacity of tens of thousands of sales men, business men and others, how it will benefit you. Every page of the book contains profitable suggestions for you. A postcard request will bring it to you. Address

The Sheldon School

1268 Republic Building, Chicago, Ill.

DO YOU WANT

to light your gas lamps by simply turning a gas cock and an electric switch, both located on the dash of your car where you can reach them without **stopping** or **getting out**?

GET THE **INST LIGHTER**

No matches, no adjustment of the gas. Saves time and gas. Used with a gas tank.

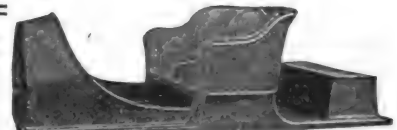
THE GREATEST CONVENIENCE OBTAINABLE.
GOOD PROFIT TO DEALERS.

SELLS ON SIGHT. Send for Circulars and Proposition.

THE INST LIGHTER CO.,

COLUMBUS, OHIO.

AUTOMOBILE



Running Gears, with pressed steel or angle iron frames, also chain or shaft drive. Any wheel base up to 120 inch, and any height of wheels.

ALSO ALL KINDS OF **BODIES**

Wheels, Axles, Steering Devices, Springs, Etc.

WRITE FOR OUR NEW CATALOG AT ONCE.

BORBEIN AUTO CO.,
2109 & 2111 N. 9th ST., ST. LOUIS, MO.

"Motors That Mote."

To Keep the Motor Motoring Use

Dixon's Motor Graphite

It makes better compression in cylinders, prevents cutting of bearings, lessens gear wear and noise. Write for free "proof" sample.

JOSEPH DIXON CRUCIBLE CO.,
JERSEY CITY, N. J.

Special Request

IN writing to advertisers for circulars or information, you are earnestly requested to mention in each case that the advertisement was seen in the "Automobile Dealer and Repairer." By so doing you will confer a favor on both publisher and advertiser

WOODWORTH TREADS

ADJUSTABLE and SELF-ADJUSTING

Save Tires, Money, Delays

Flat steel studs closely riveted through thicknesses of chrome leather present an unpuncturable surface to broken glass, nails, sharp bits of metal, jagged stones, anything which would cut or pierce the unprotected tire. The ordinarily short life of the tire is increased from three to six times, and the tire bill is reduced by more than half.

On all kinds of road, in all parts of the country, Woodworth Treads give the maximum amount of protection at the minimum cost.

Add Dignity to the Car

Easily and quickly attached to the tires, Woodworth Treads are practically invisible when the car is in motion. They give that appearance of safety and dignity which distinguishes the properly equipped automobile from the others. They are essential to safe automobiling.

For cars driven with ordinary care, Woodworth Treads guarantee freedom from slipping and skidding accidents. They protect but in no way injure the tire. Write now for catalog and for new and revised price list.

LEATHER TIRE GOODS CO., Newton Upper Falls, Mass.

New York Store, 1662 BROADWAY

Retreads That Run 5000 Miles

MADE FROM

GOOD YEAR AKRON OHIO

REPAIR MATERIALS

Think what this means to the repairman. A Goodyear tread 2-16 inches thick will frequently outwear one 4-16 inch thick made from other material.

Think of the saving you can make on the cost of your repairs. You can afford to make better repairs at more reasonable prices. To retain repair business now you need better quality and reduced cost in view of the present prices of tires.

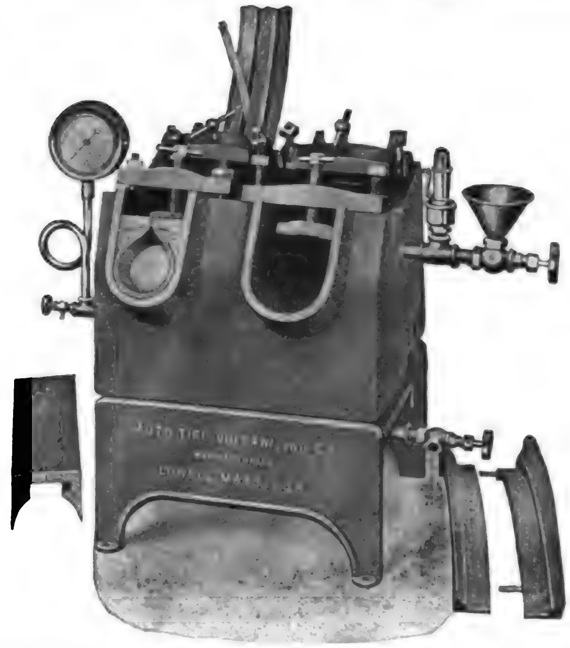
We offer to the automobile tire repairman for his own work the stock which has made Goodyear Tires famous for wearing qualities, stock made by the secret Goodyear formula.

Write for quotations and samples free to repairmen.

The Goodyear Tire & Rubber Co.

AKRON, OHIO

New Improved Adjustable Sectional Vulcanizer



Made in three sizes, No. 4 has 2½" and 3" pockets; No. 5 has 3½" and 4" pockets, and No. 6 has 4½" and 5" pockets. Each pocket of each machine is fitted with three sets of bead irons; one each, for Clincher, Fisk and Dunlop or Goodyear styles; so that any size tire of any make from 2¼" to 5½" may be perfectly cured in these machines. Each machine is provided with six sets of bead irons, four clamps (two for each pocket,) base, steam gauge, pop safety valve, and globe valve and filler.

SEND FOR FULL INFORMATION.

AUTO-TIRE VULCANIZING CO.,

LOWELL, MASS., U. S. A.

WANT ADVERTISEMENTS.

Under this head will be printed advertisements of shops for sale or to rent, or shops wanted, or situations or help wanted, or tools or machines (second-hand) wanted or to exchange, at the uniform price of two cents a word, which will include the address, for each insertion, payable in advance. No advertisement will be inserted for less than 30 cents, however small.

Remittances can be made in postage stamps if more convenient. Address,

MOTOR VEHICLE PUBLISHING CO.,
24 MURRAY STREET, NEW YORK.

STEAM CAR OWNERS—Subscribe for Steam Motor Journal, monthly, devoted to steam cars. 1409 Welton street, Denver, Col. Price, 15 cents; $1 year.

STEAM CAR OWNERS should subscribe for the Steam Motor Journal, a 28-page illustrated monthly, devoted exclusively to the interests of the steam propelled automobile; $1 per year; 15 cents per copy. Charles D. Sherman, Eastern Representative, 212 Orchard Road, New Haven, Conn.

UNIVERSAL FLUXINE brazes castiron; guaranteed; any one can do this work with regular brazing equipment. Send 50 cents stamps or currency for pound. Universal Fluxine Co., Urbana, Ohio.

WANTED—A good live agent in every garage in the U. S. to handle one of the best selling and most useful articles used by all Autoists and Tourists. Good profit. No fake. Write for free sample and prices. The Klenzola Company (Dept. B.), Erie, Pa. Mention the Automobile Dealer and Repairer.

FOR SALE—Steam Automobiles; write for illustrated bargain list. F. W. Ofeldt & Sons, Nyack, N. Y.

FOR SALE—Engines, axles, transmissions, frames, bodies, carbureters, timers and auto parts generally at bargain prices. Tell us what you want. The Logan Construction Co., Chillicothe, Ohio.

TOPS—Until further notice, runabout tops $20, touring car tops $35. C. G. Meyer & Son, Tiffin, Ohio.

RADIATORS and lamps repaired by experts. Ship to us and follow with letter. Auto Rebuilding Co., 1349 Michigan Ave., Chicago, Ill.

FORD RUNABOUT OWNERS—Now is the time to order outfit to change your N. S. or R. into new "S" roadster, new fenders, and rumble seats, dash hoods, folding hoods, glass fronts, tops, oilers, magnetos. Write for catalogue to-day. Auto Rebuilding Co., 1349 Michigan Ave., Chicago, Ill.

1908 HOLSMAN AUTOMOBILE, new and in first-class condition. Good reasons for selling. LOCK BOX 115, Carthage, Mo.

FOR SALE—Two 1908 Indian Motor Cycles, nearly new, 2¾ and 3½ h. p.; ran 400 miles; $150 and $170. Guaranteed. Write us. Renner Repair Co., New Midway, Md.

RUMBLE SEATS and "baby" tonneaus for Ford, Maxwell, Buick, Cadillac and other cars, fenders, radiators, hoods. We are the big mail order rebuilding house. Send for catalogue. Auto Rebuilding Co., 1349 Michigan Ave., Chicago, Ill.

1906 CAMERON, 3-cylinder, 15 h. p., shaft drive, sliding gear tourabout; fine shape; $480. A few Typewriter, Violin and Harp bargains; also some tools and 2 h. p. boiler and engine. Chas. Berg, Le Mars, Iowa.

4-CYLINDER SPLITDORF Dash Coil, $16; same, brand new, $24.50; four brand new 28x2½ Woodworth Treads, $29; four new inner tubes, $1.95 each; five same, used, but air tight, each $1; four brand new 28x3 casing and tubes, Fox brand, $14 per tire. Chas. Berg, Le Mars, Iowa.

FOR SALE—A Packard car 34 by 4 tires, two rear tires new, top lamps, tools, etc. Taken in trade. No use for it. Address Box 126, Voluntown, Conn.

PROMOTORS—TAKE NOTICE.—I have a pneumatic automobile wheel (not tire), covered by patents, which I wish placed on the market. This wheel does away with all tire trouble caused by punctures, blowouts, etc. Address R. D. Argue, City Hall, Newark, N. J.

AUTOMOBILES.—Must sell entire stock of automobiles before March 1st. Write us your wants. Automobile Supply Co., Burlington, Wis.

$350 buys Rambler 5-passenger 2-cylinder 22 horse power touring car, first class condition. S. L. Beougher, Wakarusa, Ind.

15-PASSENGER, 40 h. p. motor cars; three of them made by the Chicago Motor Vehicle Company; need overhauling; will sell cheap if taken at once. J. W. Chadwick, Lawrence, Kan.

15 AUTOS—MUST BE SOLD. MICHIGAN runabout, $90; steam surrey, $100; Woods electric, $125; Cadillac, $325; a 4-cylinder $2,800 car, $5.90. Others in proportion. Stamp gets gargain sheet. T. S. Culp, Canton, O.

$225 RETREADING OUTFIT. Tire, kettle, boiler and fittings. First check for $100 takes it. Address T. S. Culp, Canton, Ohio.

FOR SALE—12 h. p. Auto-Buggy, almost new, $350. Model "F" Cadillac, overhauled and repaired $500. Model "B" Cadillac $250. All in good running order. Address F. W. Fisher, Sedalia, Mo.

FOR SALE—Double opposed motor, 5x5 cylinder, 20 horse power, with all accessories complete with transmission attached, two speeds, forward and reverse, first class condition. Guaranteed. Cash $75. Address Charles W. Hopes, 36 Sanford street, Glen Falls, N. Y.

1907 LIMOUSINE BODY, built by Rothschild, in France, at a cost of $3,800; will fit a Packard; will sell for $300. Frank Reese Automobile School, 2011 North Carlisle St., Philadelphia, Pa.

JACKSON, Model "D," 5-passenger touring car; engine has been overhauled, new bearings, new crankshawt, new commutator, new springs; equipped with top, storm front; Prest-O-Lite tank. I. M. Lewis, Conneaut Lake, Pa.

FOR SALE—Two chain drive rear axles, set of artillery wheels, new 4-unit auto coil, 58 air-cooled cylinder heads, machine for 3¼ bore, 4-cylinder crank shafts and connecting rods. Address D. C. Merrill, 9 Purdy street, Bath, N. Y.

FOR SALE—Model 34, 1908 Rambler touring car; run less than 3,000 miles. Address C. E. Michael, Roanoke, Va.

2,000 pounds capacity gasoline truck; 2 cylinder opposed, 24 h. p. motor, double chain drive, 36 inch wheels, good condition, price right. L. B. Middleton, Eagle Grove, Ia.

HOUSMAN—Model 3, leather top good as new; excellent bargain. Write O. A. Rainbolt, Springville, Ind.

FOR SALE. — Three-wheel automobile chassis, complete except gasoline tank, twelve h. p. horizontal opposed engine, 4¼ bore, 5 stroke, water cooled, 30-inch wood wheels, 2½-inch single tube tires, sliding gear transmission, 3 speeds and reverse. This is cmplete, ready for body. Will sell altogether or in pieces. J. V. RANDALL, Newtown, Pa.

FOR SALE—Two cylinder Rambler 1907 Model car, recently burned; engine, transmission, frame, two front wheels, hood, gas tank, transmission differential, radiator, two oil head lights, gas lights, generator in very good condition. Could be rebuilt at very little expense. H. H. Roberts, Blossburg, Penna.

FOR SALE—One ten horse power air-cooled Logan engine, set of Timken axles, set 40-inch wheels with 1¾-inch side wire tires; almost all needed to make an automobile or truck. Address Levi Zumbrun, Brookville, Ohio.

TO ALL DEALERS The Dayton Folding Tonneau Co., manufacturers of automobile bodies, 618 Geyer Street, Dayton, Ohio, have a half page in this issue directing attention to their Artz folding tonneau. This device can be applied to any car and affords a good profit to dealers. The illustrations in the advertisement show how this tonneau folds up and how it looks when open. Write for special terms and further particulars, mentioning THE AUTOMOBILE DEALER AND REPAIRER.

THE Trenton Rubber Manufacturing Company, of Trenton, N. J., makers of Thermoid, for lining brake bands, has issued quite the most unique and artistic booklet of the season showing some of the high class cars that use this brake lining exclusively. As these cars cannot afford to have anything but the best, the idea is a good one.

SPECIAL REQUEST

IN writing to advertisers for circulars or information, you are earnestly requested to mention in each case that the advertisement was seen in the "Automobile Dealer and Repairer." By so doing you will confer a favor on both publisher and advertiser. : : : : :

A Sticking Success

Can use it on the road or at home.

Try C. O. T. Gum Gum to fill up the digouts in the rubber of your outer casing.

Four Ounce Tube Fifty Cents.

CHAS. O. TINGLEY & CO.,
Rahway, N. J.

Established 1896.

A AND J

UP-TO-DATE GARAGES AND REPAIR SHOPS

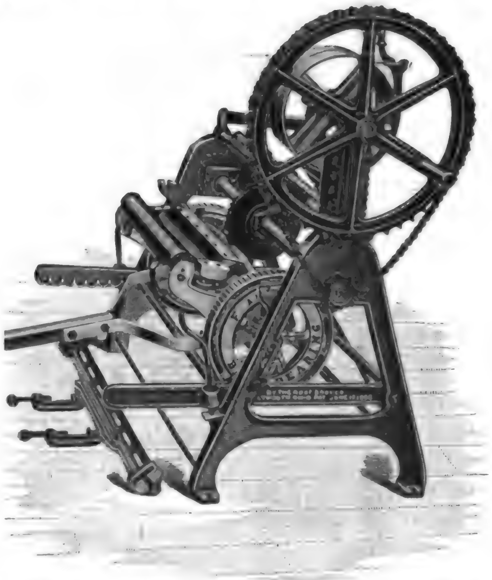
are putting in our
Cast Iron Brazing Outfits.
Complete equipment. Right now is the time. Don't wait. Write us.

The A&J Mfg. Co.,
18 W. Randolph St.,
CHICAGO, ILL.

From All Over the Country

The Repair Men—the ones who are alive and hustling—are asking in ever increasing numbers about the merits of the

Ideal Lawn-Mower Grinder



We desire to tell them about the machine—to explain WHY it is at the head of all similar implements; to show them how easy it is to operate; how quickly it will put a keen edge and an exact bevel on each blade; how strongly made and, consequently, how durable it is; how it will easily pay for itself within a week, and thereafter be a money maker every working day; how it can be used for tools, skates, etc., as well as for Lawn Mowers. You cannot afford NOT to have one of these Grinders, AND WE CAN PROVE IT. Write us to-day. You may forget if you wait until to-morrow.

THE ROOT BROS. CO., Plymouth, Ohio.
Mention Automobile Dealer and Repairer.

Jergens' Pumiss Hand-Soap

(An Automobilist's Soap)

Its extreme fitness has speedily made Pumiss immensely popular with handlers of grease and grime covered "works."

It should be in every garage and repair shop because—**it gets you cleaner quicker.**

Owners and chauffeurs can well afford to keep it in the kit for emergency cleansing.

Special quantity offer to garage owners and auto supply houses on application

NOTE TO TRADE: Mail us 5c. in stamps, to pay postage, for FULL SIZE CAKE. (Use business letterhead.)

The Andrew Jergens Co., Cincinnati, O., U. S. A.

Auto Directories Co., Inc.

CERTIFIED COPIES OF THE OFFICIAL LIST OF AUTO OWNERS, CHAUFFEURS, DEALERS, GARAGES, MANUFACTURERS AND JOBBERS IN THE U. S. AND CANADA. ALSO MOTOR BOAT OWNERS.

Offices, 1717 Broadway

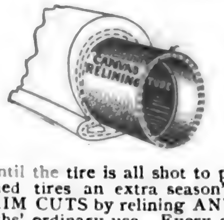
NEW YORK CITY

'Phone 858 Columbus.

WE CAN MAKE YOUR TIRES LAST TWICE AS LONG.

It's the canvas of a tire—which GIVES out BEFORE THE RUBBER IS HALF WORN OUT. We RENEW the entire canvas, shipping it to you fully stretched, formed and ready to insert.

Easily Applied. Inexpensive.



Endorsed by Leading Garages and Owners.

DON'T WAIT until the tire is all shot to pieces (although we frequently give discarded tires an extra season's use) but PREVENT BLOW OUTS and RIM CUTS by relining ANY TIRE NOW, if it has had from 4 to 6 months' ordinary use. Every owner and every garage man that is not posted, should write at once for our booklet.

Mention the Automobile Dealer and Repairer.

INNER SHOE TIRE CO., Grand Rapids, Mich.

AUTOMOBILE DEALER AND REPAIRER

A PRACTICAL JOURNAL EXCLUSIVELY FOR THESE INTERESTS.

REGISTERED IN U. S. PATENT OFFICE.

Vol. 5, No. 2. NEW YORK, APRIL, 1908. Monthly, $1.00 per year. Single Copy, 10 Cents.

PARTIAL CONTENTS:

AUTOMOBILE DEALER AND REPAIRER

A PRACTICAL JOURNAL EXCLUSIVELY FOR THESE INTERESTS.
REGISTERED IN U. S. PATENT OFFICE.

Vol. 5, No. 5. NEW YORK, JULY, 1908. Monthly, $1.00 per year. Single Copy, 10 Cents.

PARTIAL CONTENTS:

AUTOMOBILE DEALER AND REPAIRER

A PRACTICAL JOURNAL EXCLUSIVELY FOR THESE INTERESTS.

REGISTERED IN U. S. PATENT OFFICE.

Vol. 5, No. 6. NEW YORK, AUGUST, 1908. Monthly, $1.00 per year. Single Copy, 10 Cents.

PARTIAL CONTENTS:

THE BIG NOISE

The SHALER ELECTRIC VULCANIZER

Among the Garages during 1907 was a machine which was placed in over 2,000 repair shops —three times as many as the nearest competitor

makes a permanent repair on an auto-tire in shortest possible time

C. A. SHALER CO., Waupun, Wis., U. S. A. Box M.

AUTO TIRE REPAIR OUTFITS

CORES

This illustration shows a set of four cores which are designed to hold casings while in process of repair. These cores are of heavy cast iron, and are practically indestructible, holding casings from 2½ to 5½ inches, and are interchangeable.

They are placed on a heavy wrought iron stand which is bolted to the bench. They are a necessity in every repair shop, and easily pay for themselves in a short time in the saving of labor. Weight, 85 lbs.

SEND FOR FULL INFORMATION.

AUTO-TIRE VULCANIZING CO.

MANUFACTURERS,

LOWELL, MASS., U. S. A.

THE underground outfit herein shown is intended to be practicable rather than elaborate. FIRST CLASS material and workmanship at a low price. The tank is heavy galvanized iron connected to pump with twenty feet of ¾-inch pipe. Pump is made of brass and iron, all wearing parts being brass, and has no leather or rubber packing to wear out. It is a plain lift pump and is intended for use only where the oil does not have to be lifted over eight feet from bottom of tank to spout of pump, and the horizontal pipe is not over thirty feet.

This outfit, complete, consists of:
- One tank
- One pump
- Three feet of 1½-inch filler pipe and cap
- Three feet of ¼-inch vent pipe and cap
- Twenty feet of ¾-inch pipe
- Two ¾-inch elbows

Manufactured by

The Wilson & Friend Co.

3136 So. Canal St., Chicago, Ill., U. S. A.

CARTERCAR

The car with the FRICTION DRIVE.

No gears to strip.
No clutch to slip.
No grease packing.
No noise.
Only one lever.
The most simple, practical, all-around serviceable car built for $1,350. Write for catalogue

THE MOTORCAR CO.,

DETROIT, MICH.

The Latest and BEST on the Market:

TRIUMPH GREASE

It is SPONGY!
That Famous RED Grease!
TRY IT.
You will never know its Merits until you do!

GENEROUS FREE SAMPLE
If you mention this Journal: Write now for Particulars.

Manufactured only by the

PERFECTION GREASE CO.,
SOUTH BEND, IND.

Distributors:
Excelsior Supply Co., Chicago, Ill., Western Selling Agents.
James L. Gibney & Bro., Philadelphia, Pa., Middle States.
R. E. P. Sporting Goods Co., Brooklyn, New York.
The Post & Lester Co., Hartford, Conn., New England Agents.

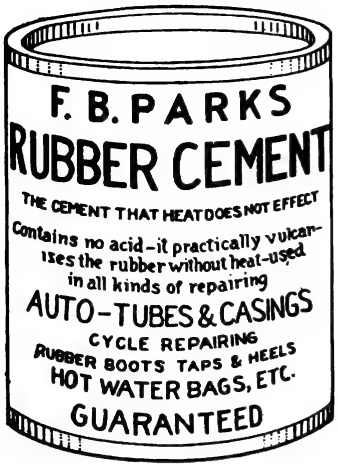
AUTOMOBILE DEALER AND REPAIRER

A PRACTICAL JOURNAL EXCLUSIVELY FOR THESE INTERESTS.

REGISTERED IN U. S. PATENT OFFICE.

Vol. 6, No. 2. NEW YORK, OCTOBER, 1908. Monthly, $1.00 per year. Single Copy, 10 Cents.

PARTIAL CONTENTS:



A SECRET PROCESS RUBBER CEMENT

Works different than any other Cement. Sticks in the hottest of weather. Has been in use nine years by the best Repair Men.

No trouble to sell the man that has used it.

Try a Sample Can and you will use no other.

Accept our special offer now.

Send 50c. for a Sample Can Pre-Paid

Why not give PARKS RUBBER CEMENT a trial?

"No Acid Cure."

F. B. PARKS CO., 173 Prescott St.
Grand Rapids, Mich.

TIRES. 1908.

Clean Up. New Goods.

Purchased during money stringency, made for guaranteed stock. Will sell as follows:

28x2½	$10.00	30x3½	$18.00	30x4	$19.00
28x3	14.00	32x3½	20.00	32x4	21.00
30x3	15.00	34x4½	26.00	34x4	22.50

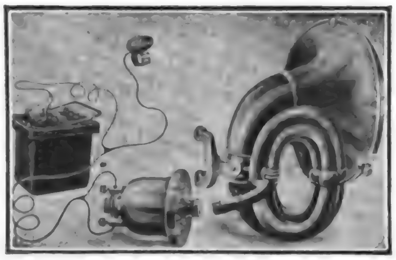
Write for particulars on batteries, coils and other sizes of cases and tubes.

Chicago Vulcanizing Co.,

1400-2 Michigan Ave., Chicago, Ill.

—THE—

Grack Unicum Electric Horn Attachment



is always ready, has no bulb to break, no reed to become clogged.

Made of best material, simple in construction; enclosed in a strong one-piece casing, it is very durable.

Its sound is loud and penetrating, and continues as long as you press the button. Easily installed, operated from the ignition battery.

Once tried, always used

Interesting proposition to responsible Dealers and Garage men.

Ask for Bulletin No. 19 and apply for agency.

THEO. H. GARY CO., 50 Franklin St., New York.

Auto Directories Co., Inc.

CERTIFIED COPIES OF THE OFFICIAL LIST OF AUTO OWNERS, CHAUFFEURS, DEALERS, GARAGES, MANUFACTURERS AND JOBBERS IN THE U. S. AND CANADA. ALSO MOTOR BOAT OWNERS.

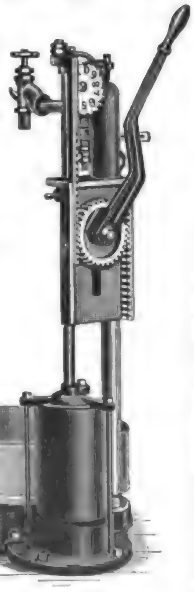
Offices, 1717 Broadway

NEW YORK CITY

'Phone 858 Columbus.

Eastern Self-Measuring Pump

Our 1907 Model, shown herewith, will quickly pay for itself in any garage.



Convenience, Economy, Safety.

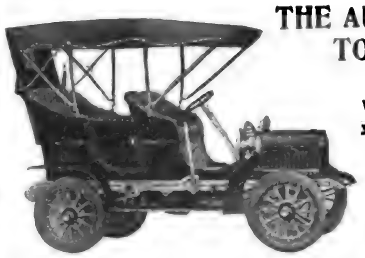
Not one drop of Gasoline wasted.

Gasoline Tanks, Pumps, Complete Storage Outfits.

Get full information by writing to

Eastern Oil Tank Co.
Lowell, Mass., U. S. A

THE AUTO TOP CO.



We Want your 1908 Orders. Get our prices before buying.

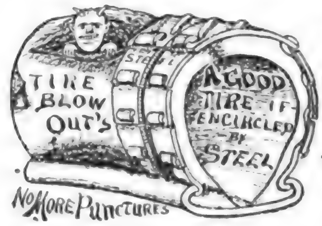
209 E. Columbia St., Fort Wayne, Ind.

MANUFACTURERS OF

AUTO TOPS

that are neat, durable, and made to fit all cars, large or small; try us on **RUSH ORDERS.**

PROTECT YOUR NEW TIRES. REPAIR THE OLD ONES.



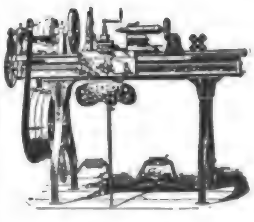
Tires Will Last Forever

Steel Link Bands

Hooks to Rim

You can fix Blowout quick. If tire is completely covered by these clasps you cannot have Blowouts, Punctures, Rim Cuts or Wearing off of tire. (Any old tire is good. How can it get away if encircled by steel?) As flexible as ever. Anti Skid.

KIMBALL TIRE CASE CO., 174 B'way, Council Bluffs, Ia.
Agency for Indiana, 417 Mass Ave., Indianapolis.



THE BARNES LATHES

9" swing
11" swing
13" swing

For Repair Work our No. 13 Lathe is right; has 13" swing, auto cross feed, length of beds from 5 to 10 feet long; furnished with counter-shaft or foot-power.

SEND FOR LATHE CATALOG.

W. F. & JOHN BARNES CO.
206 Ruby St., - - - Rockford, Ill.

GASOLINE STORAGE UNDERGROUND OUTFITS

$12.50, $25.00, $35.00, and up.

GOOD GOODS. LOW PRICES.

LUBRICATING OIL TANKS ALSO.

$3.50, $5.25, $6.50, $10.00 and up.

Cabinets, $15.75 to $100.00.

Oily Waste Cans, meeting insurance requirements.

Accurate Measures, and good funnels.

Kamp Kook's Kits that please tourists.

Ask Your Dealer. Send for Catalogue.

MANUFACTURERS SINCE 1869.

F. CORTEZ WILSON & CO.,
247 LAKE STREET, CHICAGO, ILL.

STEEL CASTINGS

Automobile Work a Specialty.

PROMPT SHIPMENTS.

Crucible Steel Casting Co.
LANSDOWNE, PA.

AUTOMOBILE SPRINGS

All Styles.

Made or duplicated by

TUTHILL SPRING CO.,
221 W. Polk Street, - - CHICAGO, ILL.

AUTOMOBILE TOPS

$14.00 AND UPWARDS

Write for Catalogue and Prices.

BUOB & SCHEU 1444 Court Street, Cincinnati, Ohio.

AUTOMOBILE DEALER AND REPAIRER

A PRACTICAL JOURNAL EXCLUSIVELY FOR THESE INTERESTS.

REGISTERED IN U. S. PATENT OFFICE.

Vol. 6, No. 3. NEW YORK, NOVEMBER, 1908. Monthly, $1.00 per year. Single Copy, 10 Cents.

PARTIAL CONTENTS:

RUNABOUT TOPS—Some New and Practical Ideas In Their Construction and Fitting. Illustrated.

GASOLINE STORAGE—Some of the Methods Employed for Installing Oil Tanks. Illustrated.

THE ELECTRIC CAR—Wiring Diagrams and Simple Explanations of Correct Methods. Illustrated.

A NEW ENGINE—Valveless and Said to Be Silent, Powerful and of Wide Range of Work.

CARS FOR PHYSICIANS—What They Think of Their Use in Their Professional Work.

SELLING CARS—How Best to Prepare for the Work and How to Treat Prospective Buyers.

LESSONS FOR DRIVERS—The Month's Record of Accidents and What Is to Be Learned From It.

REPAINTING—Some Necessary Surfacing Processes and How the Varied Jobs Should Be Done.

AUTOMOBILE LUBRICATION—The Various Methods and the Comparative Merits of Each.

TROUBLE DEPARTMENT—Questions and Answers Upon a Wide Variety of Timely Subjects.

Editorials, Helpful Paragraphs and Scores of Pointers For Car Users.

AUTOMOBILE DEALER AND REPAIRER

A PRACTICAL JOURNAL EXCLUSIVELY FOR THESE INTERESTS.

REGISTERED IN U. S. PATENT OFFICE.

Vol. 6. No. 4. NEW YORK. DECEMBER, 1908. Monthly, $1.00 per year. Single Copy, 10 Cents.

PARTIAL CONTENTS:

SIZE 66--6 VOLTS
60 AMPERE HOURS
PRICE $15.00
GUARANTEED ONE YEAR

GUARANTEED SUPERIOR TO ANY OTHER
STORAGE BATTERY REGARDLESS
OF PRICE.

GEISZLER BROTHERS
STORAGE BATTERIES
518 West 57th St.
NEW YORK CITY.

THE ORIGINAL AND ONLY GUARANTEED NON-SULPHATING STORAGE BATTERY

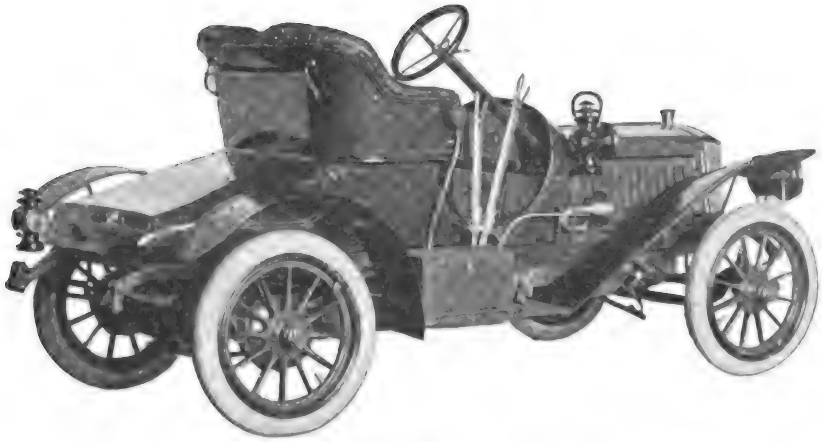
We Will Exhibit at Chicago National Automobile Show, Feb. 6-13.

AUTOMOBILE DEALER AND REPAIRER

A PRACTICAL JOURNAL EXCLUSIVELY FOR THESE INTERESTS
REGISTERED IN U. S. PATENT OFFICE.

Vol. 6, No. 6. NEW YORK, FEBRUARY, 1909. Monthly, $1.00 per year. Single Copy, 10 Cents.

PARTIAL CONTENTS:



This shows a Mitchell H to which an Artz Folding Tonneau is fitted. It is still a runabout, and only 55 pounds heavier; yet the extra seat is there, protected from dust, mud, and rain, and can be opened ready for use in five seconds without the use of any tools. There is room inside for pump, tools, and extra wraps.

$100 LIST

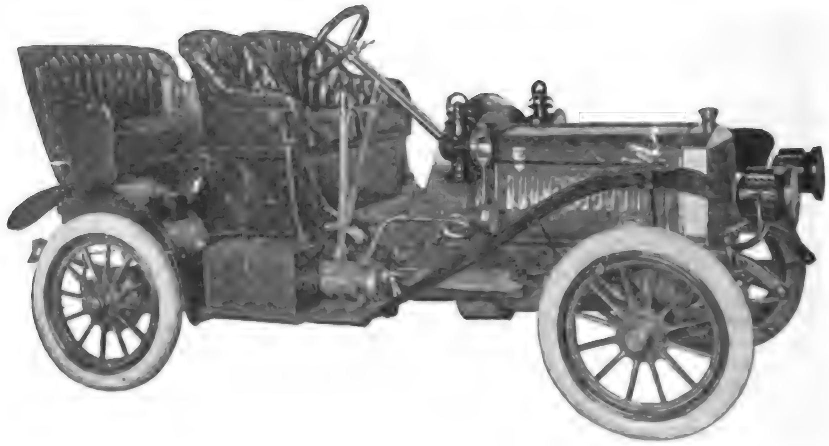
Made for many other cars.

DEALERS

The folding Tonneau is easily fitted on, pays a good profit and gives satisfaction.

ORDER ONE

This shows the folding tonneau open and ready for use. In this position it is as firm, strong, and comfortable as a standing tonneau, and provides for "the occasional extra two." A Rubber floor mat and all fastenings go with each tonneau.



Dayton Folding Tonneau Co.

Manufacturers Automobile Bodies and Five Ply Seat Backs.

618 Geyer Street, Dayton, Ohio.

SAVE YOUR CAR

BY ATTACHING OUR

Supplementary Spiral Spring

OVER 15,000 IN USE

Send for "MISSOURI PROOF"—we show you—and our 1908 BOOKLET-it's interesting.

Beware of worthless makeshift single or double coil imitations and infringements.

Liberal NO RISK propositions to the trade.

WHAT OTHERS SAY:

"100,000 miles and not a broken side spring." C. W. NUGENT, St. Louis.

"Am thoroughly satisfied with them." E. W. GIBSON, The Point, Tasmania.

"They ride extremely nice." BRITISH-AMERICAN CO., Coventry, England.

"They are everything you claim for them." Dr. F. B. BUCK, Jacksonville, Fla.

"I cannot understand how I did without them." LEOPOLD KAHN, New York City.

"Make the car ride very comfortably." S. N. BRIGGS, Los Angeles, Cal.

"I cannot praise them enough."—H. L. TURNER, Boston.

The above extracts from a select few letters recently received give an idea of the range of territory in which the Supplementary Spiral Springs are popular. We have too many to print.

SUPPLEMENTARY SPIRAL SPRING CO., Inc. Main Office, 4522 Delmar Ave. ST. LOUIS, MO.

NEW YORK BRANCH, Motor Mart Bldg., 1876 B'way. BOSTON, 889 Boylston. CHICAGO, 1218 Michigan.
PACIFIC COAST, 424-446 Stanyan Street, San Francisco.

TIRES. 1908.

Clean Up. New Goods.

Purchased during money stringency, made for guaranteed stock. Will sell as follows:

28x2½	$10.00	30x3½	$18.00	30x4	$19.00
28x3	14.00	32x3½	20.00	32x4	21.00
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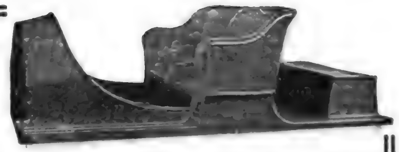

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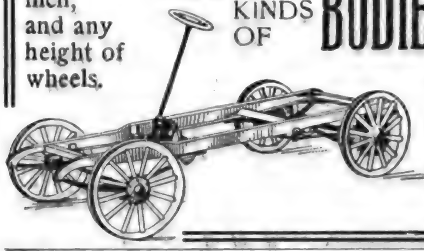

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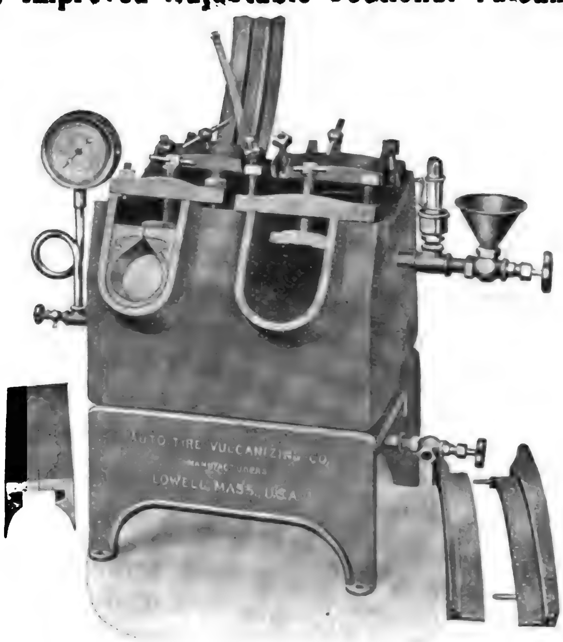

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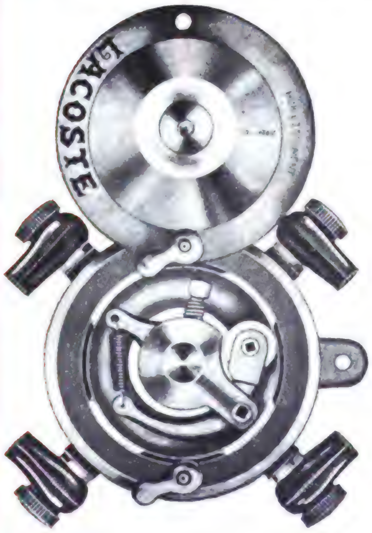

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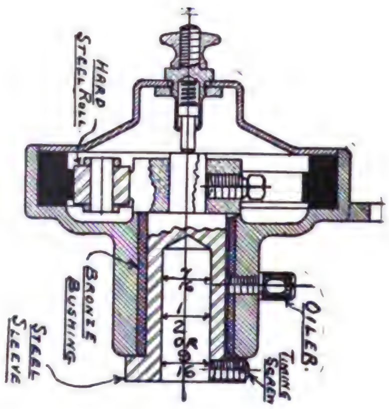

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